ELECTRICAL WEST

THE ALL-INDUSTRY MAGAZINE OF PROGRESS

GRAW-HILL CO.
OF CALIFORNIA

DECEMBER, 1941

25c a Copy

Christmas Again!

Time to cash in on the electrical gift preference

People like to give electrical gifts. They're so practical as well as glamorous. There's such a variety—something for everyone and at such a wide range of prices. As usual Edison December advertising directs buyers to the electrical appliance dealers in Southern and Central California. Get your bigger share of this business. Display, advertise and demonstrate electrical appliances for Christmas gifts.

SOUTHERN CALIFORNIA ALL-WINTER SUN FESTIVAL

Christmas
ELECTRICAL GIFT SUGGESTIONS
Christmas IS THE TIME FOR GIVING ELECTRICAL GIFTS FOR BETTER LIVING
At your Dealer or Edison Office

SOUTHERN CALIFORNIA Edison

ELECTRICAL WEST (with which is consolidated The Journal of Electricity), December, 1941. Vol. 87, No. 6. Published monthly by the McGraw-Hill Company of California, 68 Post Street, San Francisco, Calif. Entered as second class matter at the post office at San Francisco under the Act of March 3, 1879. Additional entry as second class matter at the post office at Los Angeles. Printed in U. S. A. Subscription rate in U. S. and U. S. possessions, and Canada, $2 per year; all other countries $3 gold (thirteen shillings). Single copy 25c.
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CALL ON THESE "RED CAPS"

To Give Metropolitan Service on Your Rural Lines

FP-119 Reclosers on the Assembly Line

YOU'LL save money—and take a load off your mind as well—by installing FP-119 circuit reclosers on your rural lines. Scores of operators, from Canada to tropical Puerto Rico, have done so. They find that these reclosers provide continued service through as many as 90 per cent of their line faults.

FP-119 reclosers, they report, give real service!—by automatically restoring power immediately after interrupting the circuit to clear transitory faults. Recently, during a severe electrical storm in South Carolina, one of these reclosers cleared *16 line faults* during a single night—and promptly restored service every time!

136 LINE FAULTS—*only three sustained outages*

And from Rushville, Ind., A. M. Miller of the Southeastern Indiana Power Company writes, "Results were so gratifying that we purchased three more FP-119's. We now have a three-month record and it reveals that we have had 136 operations in this period. Three of these were lockouts caused by limbs falling over the lines. On the remaining 133 we never knew when a fault occurred, as we had no outages at all."

Performance like this has caused the demand for FP-119 reclosers. And this increasing demand, together with standardization and efficient production-line assembly methods, has, in turn, made possible still another reduction in price—to $99! Why not take advantage of this new low price, now? If you'd like more detailed information, just ask for Bulletin GEA-2846A. General Electric, Schenectady, N. Y.

GENERAL ELECTRIC

857-4-7400

Here in the WEST

People

R. W. Jimerson
has been political editor of the San Francisco *Examiner* since 1938, and prior to that time financial editor for several years. During his sixteen years on the editorial staff of the *Examiner*, he has specialized in politics, taxation, public utility affairs and kindred topics. With the exception of an occasional foray into the advertising field, he has been a newspaped reporter for 25 years. Before coming to the Pacific Coast, he worked on newspapers in Wisconsin and Minneapolis, and on a trade magazine in Chicago. He held the editorship of the Pillsbury Flour Mills house organ for a brief period, leaving the company to become City Editor of the Minnesota *Daily Star*. Coming to California in 1923, he arrived in San Francsico two years later, after advertising department work on the Long Beach *Telegram* and the San Diego *Union*. The feature article of this issue, "Power Politics," was compiled by Jimerson in his regular capacity as an observer and writer on political and economic issues of vital import to San Francisco.

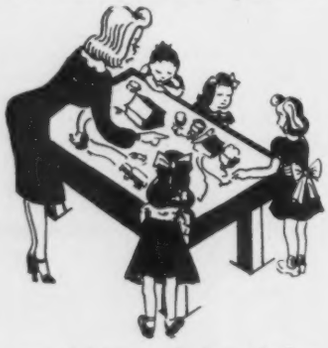
Glen W. Bills
is one of the younger engineering executives of the Bonneville Administration. A graduate of the University of Washington in 1938, he remained at the university in a teaching capacity on the electrical engineering staff for a year; spent three months at Grand Coulee; was loaned to the War Department for four months for work in connection with St. Lawrence River project plans. He is now assistant electrical engineer at Bonneville.

Lloyd Kamm
who ventures into the "mood conditioning" of light, discussing the various kinds of lighting—good and bad—that different types of personalities prefer, has been an illuminating engineer and salesman for Southern California Edison Co. and Washington Water Power Co.

He takes issue with the theory that the lighting expert is the only one who has a right to pick lighting—feeling that the buyer also should have a voice in choosing the lighting with which he will live and must be satisfied, once installed.

Preview

School Lighting
has been approached wrongly from the standpoint of its effect on the speed of



acquisition of knowledge, said Charles Gibson, school superintendent, whose talk on this subject brightened the PCEA lighting group meetings at the Fresno conclave. What he, as a school executive, does feel lighting can offer a school will be told in the publication of his stimulating paper next month—at the request of Fresno attendees who heard him deliver the talk.

Sales Guide
for January issue will be concerned with light conditioning—one of the most alive and opportune fields for sales activities at the present time. How light conditioning can become an im-

portant part of a dealer's sales program will be told in detail as well as pictured.

Forecast

Accumulation of data for the February forecast issue is now under way—with the editors pursuing direct reports from all parts of the West relative to this theme. As in the past, the forecast number will give the first clear, concise and complete picture of what electrical activity will be like in 1942.

This issue should be more valuable in 1942 than it ever has in the past, as the industry is facing the most sweeping changes in its history. The forecast will be of genuine service to all charged with running or operating an electrical business.

Pages

Power Politics 27
By R. W. JIMERSON—Proves the national importance of San Francisco's recent Hetch Hetchy election.

Network Analyzer Solves System Problems 30
By GLENN W. BILLS—Bonneville installs first analyzer in the West to speed solution of transmission line construction and operation.

Slumbering Sockets 37
Shortcomings and opportunities of the industry in the home wiring field.

Lighting Experts vs. Buyer's Desires 49
By LLOYD KAMM—Experts and buying public sometimes disagree on what's the best lighting—and perhaps John Q. isn't always wrong.

New Products 4
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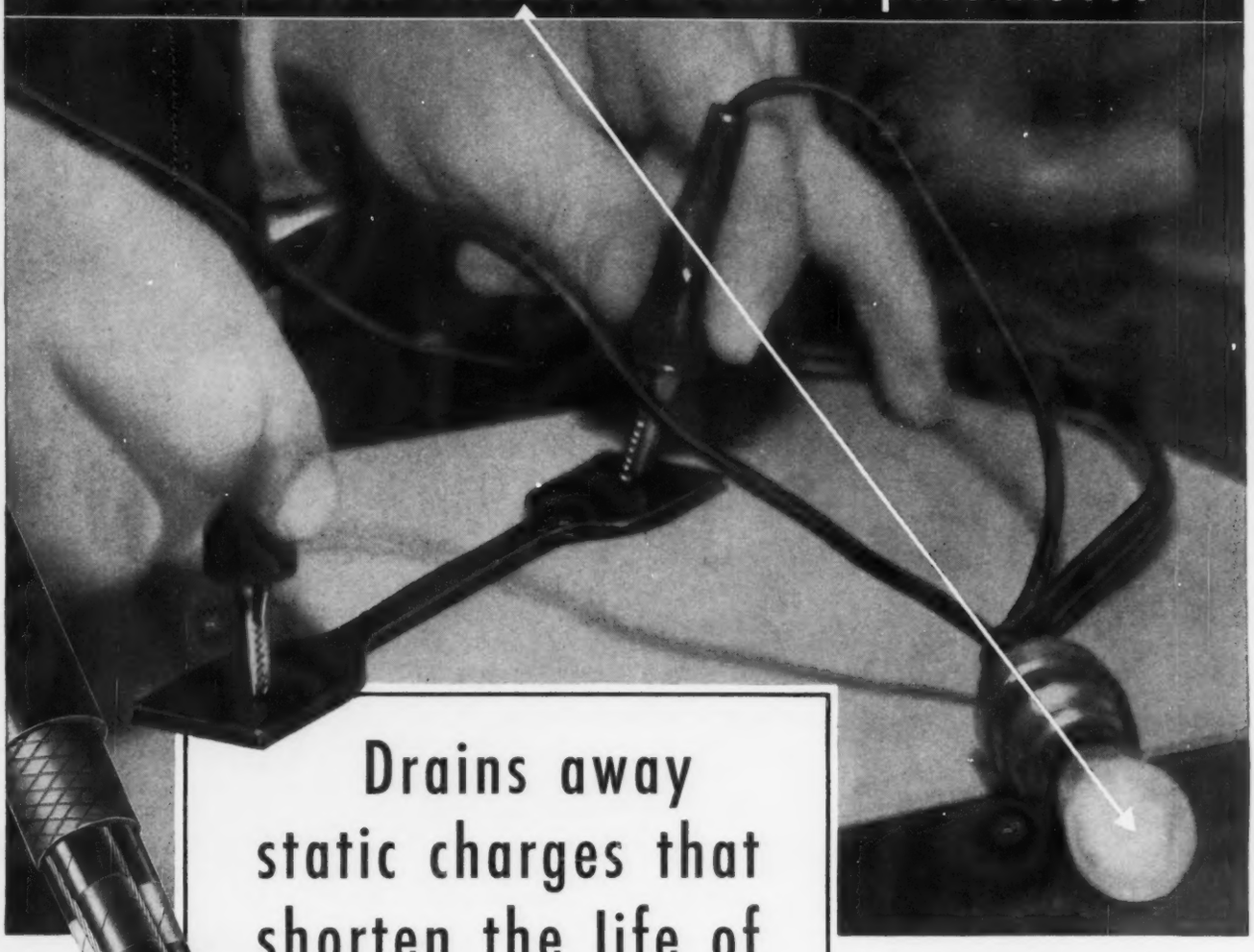
Engineering 30
Sales 37
Sales Guide 41
Lighting and Wiring 45
Editorials 52
Associations 54
News 61

Cover picture is of the famous Christmas Tree Lane in Fresno, California, where over two miles of trees are magnificently lighted in the true Christmas spirit—enjoyed by visitors and residents alike.

CONDUCTING RUBBER makes it possible...



Drains away static charges that shorten the life of Power Cables

This photograph, taken in our laboratory, shows a 15-watt bulb being lighted by the flow of electric current from a 110-volt plug-in, through a "dumbbell" sample of conducting rubber.

CONDUCTING RUBBER is one of the most important discoveries of the present day. Its use on the surface of the insulation of high voltage power cables is a revolutionary step toward greater safety and longer life. Type PS Semi-Conducting Shielding, developed by the American Steel & Wire Company, completely eliminates corona and consequent generation of ozone—thus preventing electronic ionization of air gaps within the cable. This permits operation at high voltages that would otherwise cause certain failure.

Type PS Shielding—by preventing corona — makes any insulation "corona-proof." Standard rubber insulating compounds may now be used in high-voltage cables without the necessity of sacrificing tensile strength, elasticity and other typical rubber-like properties in order to make them "corona-resistant."

Many other types of high-voltage power cables utilizing the advantages of flexible, discharge-suppressing Type PS Semi-Conducting Shielding are now available. Write today for more information.

COLUMBIA STEEL COMPANY, *San Francisco, Pacific Coast Distributors of U·S·S Electrical Cords and Cables*

Manufactured by

AMERICAN STEEL & WIRE COMPANY, *Cleveland, Chicago and New York*

United States Steel Export Company, New York

UNITED STATES STEEL

You wouldn't make a gas connection with a set screw connector. An electrical connection is just as important.

Stop those current losses with a connection that grips the cable like a Gorilla. The principle of the nut and wedge are used for a maximum compression. Dependable locking action in every connector. Pressure is uniformly distributed over full contact area.

A "Gorilla Grip" Connector requires no special tools and may be used over and over again without loss of efficiency. Investigate, write for descriptive literature.

National Electric
PRODUCTS CORPORATION
1300 Fulton Bldg. Pittsburgh, Pa.

PRODUCTS
that are news

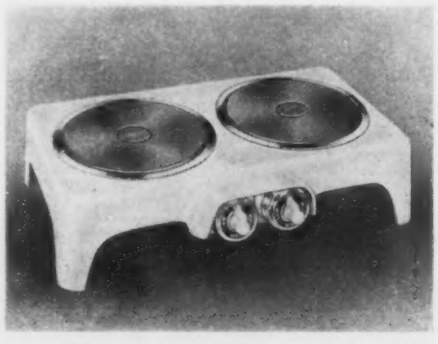
Floor Vacuum (1200)

Eureka Vacuum Cleaner Co. has a new floor model vacuum featuring a new design, a fully automatic nozzle adjustment, an integral-unit power plant, a new spill-proof bag design. The most important development, according to the manufacturer, is the power unit, because of the fact that the motor and fan are assembled as a unit before installing, permitting balancing and testing. The motor

and fan are assembled in a coordinated unit and all rotating parts are balanced. Electrical field is mounted on moulded plastic end-bells and is totally insulated from cleaner frame and handle. A special form of wire insulation is used in the motor winding, which is resistant to heat and makes possible the use of large-size wire, which results in lower operating temperatures, it is claimed. The cleaner has a clearance of only 7-3/16 in. at the highest point on the motor hood.

Hot Plate (1201)

Edwin L. Wiegand Co. has developed a hot plate with a unit consisting of a special alloy casting with nickel chromium coils embedded in refractory in channels in the



under side of plate. The unit is supplied with 1200 or 2000 watt units in single or double frame with switch provided for 3-heat operation on 115 or 230 volts.

Automatic Electric Blanket (1202)

An automatic electric blanket is being promoted by General Electric appliance and merchandise department as a great merchandising opportunity for the dealer. According to G-E, the potentialities of the automatic blanket are indicated by the fact that only two electric appliances, refrigerators and radios, exceeded the retail sales volume of the blanket industry in 1940. Statistics indicate that specialty salesmen have not for many years had a new product with such potential sales volume. More than 90% of the retail electric appliance sales in 1939 were items introduced to the trade before 1920, according to the company, and as for the domestic departments of department stores, it has been pointed out that many have suffered from a lack of traffic. The automatic blanket provides an answer for those seeking a vital traffic center, according to G-E.

Combination Meters (1203)

Developed to meet the extension of demand rates to smaller loads, a new low-cost combination watthour and thermal demand meter—available for the first time in standard house size, case and mounting—has been announced by Westinghouse Electric & Mfg. Co. With a-c ratings of 5, 15 and 50 ampere capacities, 120 to 240 volts, 2 and 3 wire for reading up to 20 kw., the unit is similar to the ordinary watthour meter in general appearance. According to the manufacturer, eliminating self-contained transformer used in previous thermal meters, the voltage component of the thermal elements is fed by a secondary coil wound directly over the potential coil of the watthour meter. This arrangement makes it possible to combine the watthour and thermal demand mechanisms into a single unit. An improved design of the thermal unit greatly reduces the required operating en-

ergy. Dial and nameplate are combined with the demand scale located at the bottom of the dial. Two demand pointers are provided; one operating as a pusher and the other to indicate the maximum demand. The latter is accurately balanced and held in position by an adjustable friction device to eliminate shifting due to vibration. The watthour mechanism has standard adjustments for full load, light load, and power factor; the thermal unit has only two adjustments for zero and for full scale.

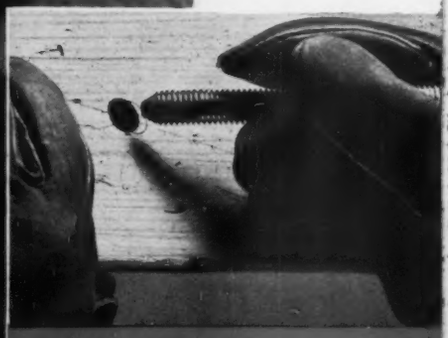
HERE'S THE POINT

of HUBBARD "DRIVEPOINT" BOLTS

for Pole Line Use

EASIER TO "DRIVE-IN"!

EASIER TO "DRIVE-OUT"!



EASIER TO FIND THE HOLE!

EASIER TO START THE NUT!

A TYPE & SIZE FOR EVERY NEED, HOT-DIP GALVANIZED

An Original HUBBARD Development

Ask any lineman who has ever used Hubbard "Drivepoint" bolts, which bolt he prefers and why. He'll tell you that the tapered "Drivepoint" makes his work faster, easier and safer—faster to find the hole and "drive" the bolt in—easier to start the nut and turn it on, with only one of his heavily gloved hands. On salvage operations, Hubbard "Drivepoint" bolts are quickly and easily "driven-out" of the hole with no possibility of damage to the threads—eliminating re-threading and re-galvanizing. Moreover, Hubbard's special "Hot-dip" galvanizing makes the double-arming, cross-arm and carriage "Drivepoint" bolts last almost indefinitely. Make it a point today to specify Hubbard "Drivepoint" bolts for all of your pole-line needs.

PATENTED

HUBBARD

Hubbard and COMPANY

OAKLAND, CAL. PITTSBURGH CHICAGO

HUBBARD

HANG THE LOAD ON HUBBARD HARDWARE

Stepping Up Production?

Solve Your Voltage Problems With Custom-Built Gardner Transformers

Overcome your special voltage problems with Built-to-Order GARDNER Transformers. Individually built to meet YOUR particular operating conditions, they help simplify the problems of increased production.

You get dependable, economical, trouble-free performance from Gardner Transformers—manufactured more quickly and more efficiently than ever before in our newly expanded Emeryville plant.

Write TODAY for full details.

1—1000 KVA, 4800/4500/4200 to 180 Volt Transformer used in large foundry working on important Defense contracts.

Gardner Electric Mfg. Co.

4227 Hollis St. Emeryville, Calif.

Represented by

MAYDWELL & HARTZELL

INCORPORATED

SAN FRANCISCO - LOS ANGELES - PHOENIX - PORTLAND

STRONG AS AN OX

Lloyd amazing, new plastic compound guarantees against costly breakage. Contact and lock are positive. No strain on pins or casing. Tempered steel spring more than doubles strength of lock.

LLOYD PRODUCTS CO., Box C, Edgewood Sta., Prov., R. I.

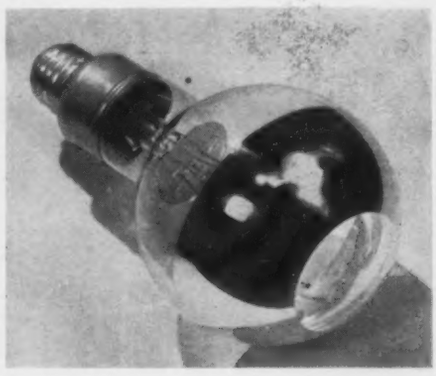
Representatives in 22 Leading Cities

Black — Cat. 351
Black Combination with Starter Socket Cat. 353

White — Cat. 351-W
White Combination with Starter Socket Cat. 353-W

Heat Lamp Control (1204)

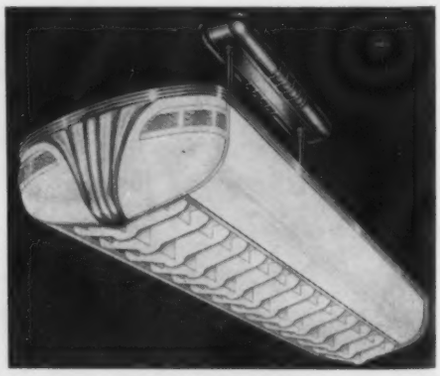
A new type of infra-red heat lamp has been developed by the Birdseye Research Laboratories of Wabash Appliance Corp. This is claimed to be the first commercial type of radiant heat lamp whose design and construction makes 100% control of heating efficiency possible. The bulb is designed to put in use what Wabash engineers term "spilled heat." It is claimed that many efficient heating reflectors provide convergent, parallel or divergent heat beams as needed, but there is still an average of 25% of the heat rays lost outside the control of any reflector. The new bulb has a ring lining of pure silver sealed inside the bulb at a point just below the focal point of the filament. This silver ring leaves a bullseye spot



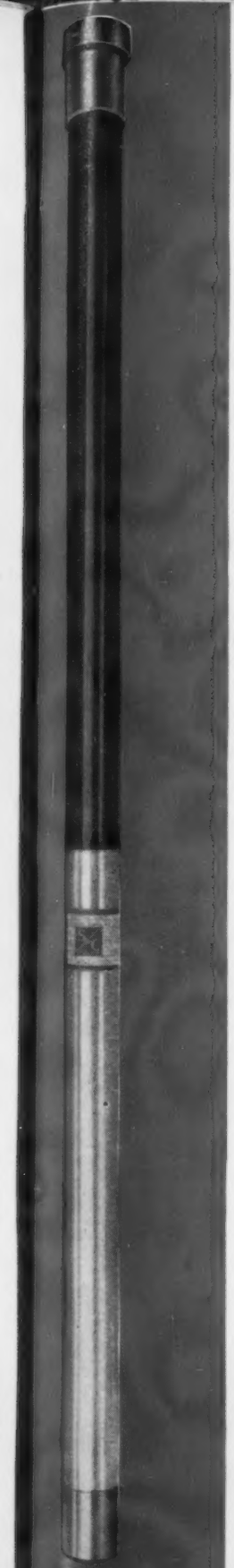
through which heat beams are projected from the filament direct to the heating area without spill or loss, according to the manufacturers. The remaining heat rays, including those formerly lost, are now gathered into the control area of the reflector by the silver ring lining, and projected down the heating area. A feature of the new unit is the mechanical strap-in base made heat-proof to keep the base from loosening up under the heat developed in infra-red tunnel installations. The lamp is available in 250-watt size, tungsten filament only, and will fit a standard Edison screw socket. Average burning life is claimed to be in excess of 5,000 hours.

F Plastic Unit (1205)

Day-Brite Lighting, Inc., has produced a new "Day-Lume" fluorescent fixture with louvers featuring a moulded plastic end unit with a two-tone appearance, with louvers providing



shielding from normal line of vision. These fixtures are available in ceiling and suspension types, designed for 48-in. and 60-in. lamps, using from four to eight per fixture.



Refill Units for S & C Type SMG Fuses are replaceable in the field.

TYPE SMG POWER FUSES

For 46,000 to 138,000 Volt Service

★ **Up to 9,000 r. m. s. Amperes Interrupting Capacity** ★

● S & C has extended their higher interrupting capacity fuses into the transmission voltage class—46,000 to 138,000 volts—thus providing system protection equivalent to that of much larger and costlier circuit interrupting equipment.

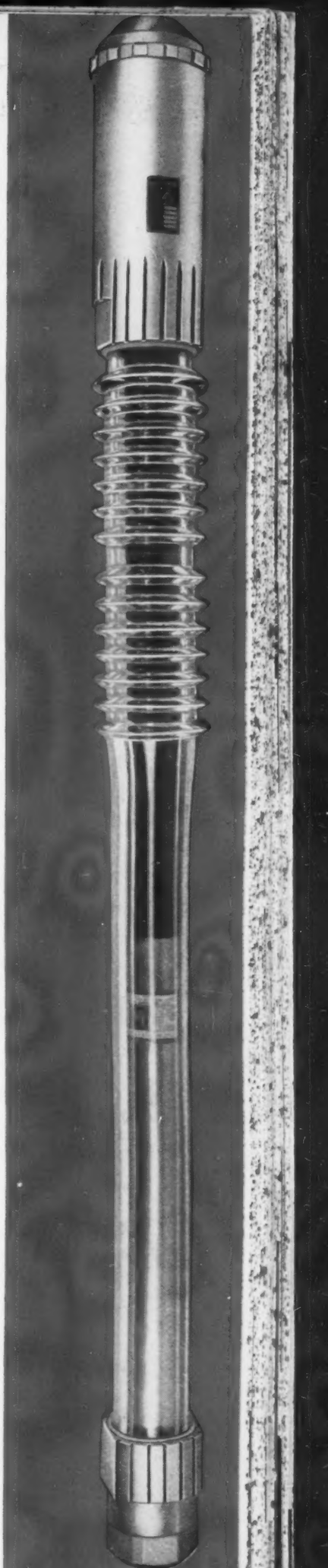
Type SMG Fuses combine for the first time the features of the S & C type COR high voltage liquid fuse and the S & C type SM boric acid high interrupting capacity fuse.

Servicing is easily and quickly accomplished in the field—by replacement of the refill unit. Let us point out where SMG Fuses can serve you—save time and installation costs. Complete data are included in Bulletin 200F and Data Sheet 240-03.

SCHWEITZER & CONRAD, INC.
4435 Ravenswood Avenue **Chicago, Illinois**

Experience Will Choose the S & C Fuse

Example of S & C Type SMG Fuse substation installation.



How "GF" (GAS FILLED) New Self-supervising Cable MADE GOOD On First Test in Big City

AT the bottom of an excavation in downtown Manhattan*, Type GF cable met and passed its first test with ease. A workman with an air drill accidentally gouged into both the conduit and the sheath of a line of this new cable. Not being a cable engineer, the workman didn't report the accident at once. He didn't realize that such a puncture, sooner or later, means "lights out" not only for equipment on the circuit but also for the cable itself.

Because the cable was of the new G-E gas-filled type, this incident had a happy ending. In less than half an hour after the cable was punctured, up drove the power-company service men—without having been summoned by the workman. Repairs took little time because the break was ***known in time,*** and more serious damage was avoided.

The service truck had been called by the cable itself. When the sheath was punctured, reduction of pressure, caused by loss of gas, operated a pressure relay. This in turn sounded an alarm in the control room at the generating station.

A total of more than 140,000 feet of Type GF cable is in service. Do you have our booklet describing this cable? The number is GEA-3652. Ask the nearest G-E office for a copy. General Electric Company, Schenectady, N. Y.

**System of the Consolidated Edison Co. of New York, Inc.*

Three-conductor Type GF cable for 10 to 40 kv

GENERAL ELECTRIC

501-7-1200

You can have THE RIGHT LINK at the RIGHT PLACE at the RIGHT TIME

KEARNEY'S *Precision Built* FUSE LINKS

THERE are many reasons why so many operating men are using Kearney Fuse Links. Whether they specify the new Type 200, the Quik-Action Fitall or the Trip-O-Link Fuse, they find they get the dependability expected of a precision built link. With such factors as adaptability, strength, temperature, durability, accuracy and speed carefully considered in their design, these links assure efficient switch performance. And now ease of handling, storing and dispensing have been added to other features to give even greater value, at no extra cost.

features of the NO. 12165-B FUSE LINK DISPENSER

- *See from the ground whether you have links on the pole ready to handle an emergency. Pul Tabs of Kearney Fuse-Paks tell you.*
- *Keep your fuse link coordination schedules accurate with a supply of proper amperage sizes right on the pole.*
- *You might have the right link on your storeroom shelf, but why not have it at the point of use — in a pole-mounting fuse container?*

Using KEARNEY FUSE LINK DISPENSERS *COMBINED WITH NEW* PUL-TAB FUSE-PAK

At the right, the new Kearney Pul-Tab Fuse-Pak. Contains 5 fuse links, each packed in individual weather-resistant bags, each bag having a "pul-tab" clearly marked with amperage rating of link.

Above, the new Kearney Fuse Link carton for easier storeroom handling contains 5 Pul-Tab Fuse-Paks, 5 links to a Pak, 25 links to a carton. Each carton carries information on primary fuse sizes for distribution transformers.

NOW—minimize the risk of upsetting your fuse link coordination schedules—the hazards of over-fusing—unnecessary delays in restoring service. Assure these advantages by installing, right on the poles, at important switching locations, a Kearney Fuse Link Dispenser which is specially designed to hold a Pul-Tab Fuse-Pak containing five proper links.

After all, for convenience and emergencies, you want the right link at the right time, at the point of use—and reserve links, of course, on your storeroom shelves.

all Kearney Links packed in Pul-Tab Fuse-Paks

Whether or not you use the No. 12165-B Fuse Link Pole Dispensing Boxes which, incidentally, cost only 49c each, take advantage of the handy Pul-Tab Fuse-Paks and handy cartons of 25 links, the standard package for all Kearney Links, at no extra cost.

EXCLUSIVE SALES REPRESENTATIVES

MAYDWELL & HARTZELL INCORPORATED

LOS ANGELES • SAN FRANCISCO • PORTLAND • SEATTLE • PHOENIX • RENO • TACOMA • SPOKANE

BOOKS
you may want

FIRE DEFENSE, published by National Fire Protection Assn., 232 pages, 154 illustrations, $1.50. Explaining the problems of fire in wartimes covering air-set fires, bombs, sabotage, the activities involved in civilian defense, fire fighting and the safeguarding of industrial production for defense, this book includes statements by leading N.F.P.A. specialists on various phases of the problem. Included is a comprehensive report on British fire defense measures, and sabotage discussed by an FBI expert. Manufacturers should be particularly interested in what must be done to assure that fire will not interrupt the flow of material off production lines.

★

TELEMETERING, SUPERVISORY CONTROL AND ASSOCIATED CIRCUITS, a special report published by the A.I.E.E., summarizes information concerning electric telemetering and supervisory-control systems currently in use or commercially available in the United States. A detailed discussion of interconnecting circuits suitable for such purposes is included.

Telemetering and supervisory control equipment, although electrical developments and widely used in the electric power industry, are finding their greatest potential field of application in non-electrical industries, according to this 48-page AIEE bulletin. In recognition of this ever-widening field of application, the report has been prepared in such form and terminology as to make it readily useful to engineers of any branch of industry.

★

ELECTRICAL MANUFACTURING, Howard Stephenson, Westinghouse Electric & Mfg. Co., 75c, Bellman Publishing Company, Inc. A monograph treating on personal qualifications required for engaging in this industry, scholastic training needed and an analysis of employment opportunities. Also covered are remunerations to be received, chances for advancement, a statement of advantages and disadvantages and possibilities for both men and women in the profession.

★

NEW BULLETINS "A.I.E.E. Test Code for Direct-Current Machines" and "Revised Report on Standards for Fuses Above 600 Volts" have been issued by the Institute committee on electrical machinery. The bulletin on fuse standards is divided into sections on service conditions, definitions, ratings, tests and name plate markings. The test code bulletin describes in reference form the more generally applicable and accepted methods of conducting and reporting tests of a commercial nature, which apply to the fulfillment of performance guarantees and tool acceptance tests.

PELTON *engineering and* CARBONDALE

refrigeration products are effectively combined to service the needs of western industry... offering these unusual advantages for detail planning, manufacture and assembly of equipment, and installation. The experience and facilities of these two nationally recognized organizations is immediately available, whether your refrigeration project is large or small, simple or highly involved.

●

Stocks Maintained in Our San Francisco Plant

Ask For Literature

●

The Pelton Water Wheel Company

Refrigeration Engineers

2929 Nineteenth St. San Francisco

Western Representatives for the Carbondale Division of the Worthington Pump & Machinery Corporation.

BLW THE BALDWIN GROUP PELTON

Subsidiary of THE BALDWIN LOCOMOTIVE WORKS

LETTERS
to the editor

Editor Electrical West:

After a trip to Panama to get the Cory and Joslin jobs there organized, I went on a vacation, then came here to Honolulu to get this job going and expect to see it through. You know, of course, of Cory's death. I feel obligated to finish this job of about a million electric. We have only about 20 men here at present but plenty more will be here in a month or so. The job will not be complete until about May so I am resigned to a long time here.

It consists of all electrical work, pumps, transformers, three 900-kw. generator sets, two complete substations with primary, secondary and d-c switchgear, plus two control boards actuated at the main power plant, new control board for control of mg. sets and switchgear for two drydocks. It also includes all underground distribution for two docks including 11-kv. line, 2.3-kv. line, 460-volt three-phase, 230-volt three-phase, 230/115 volt d-c, 199/115 a-c, telephone work and cable and remote control cables both for subs and ships service outlets. There are 18 switch and plug panels for phones and five types of current each on docks, plus 18 capstans, 18 welder stations of 6 circuits each and 18 wheeler stations plus miscellaneous tunnel lights, mg. plug-in outlets too numerous to mention. Makes the Bridge sub look like an outhouse. Anyhow, I am plenty busy. Cobban and McCarthy of Westinghouse here and live in the same court. Both send regards.

As for WEST, must say that in spite of loss of your writers, the articles seem just as interesting as before and in the eyes of electrical construction men that I have spoken to, the articles are even more to their liking.

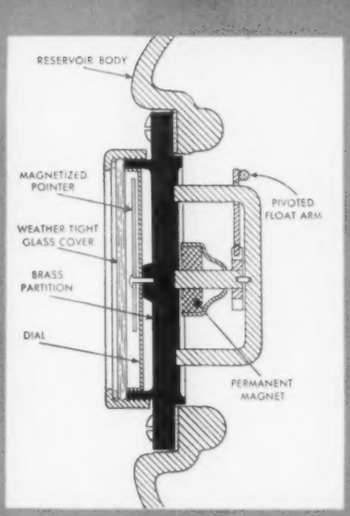
Regards to all

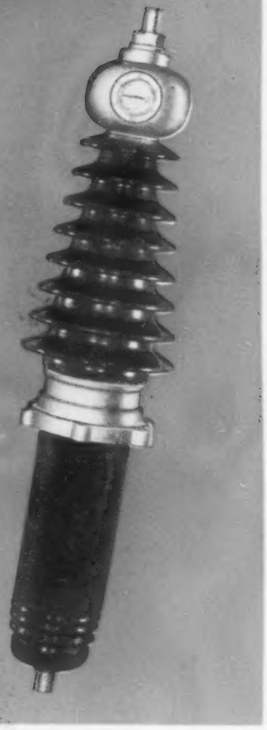
Signed: C. EWDIN PORATH
Honolulu, T. H.

Aloha to Ed Porath, Rollo Cobban and McCarthy in Honolulu. Ed Porath was superintendent for Alta Electric in wiring Golden Gate Bridge, later maintenance electrician there, went back to construction for Cory & Joslin.—Editors.

THE MAGNETIC OIL GAUGE ON O-B CLASS G BUSHINGS

Having a large, plainly marked dial, the magnetic oil gauge now furnished on O-B Class G bushings can be read easily from a considerable distance. And it *stays readable* indefinitely because oil cannot reach and discolor the dial or outer glass. This new gauge, adopted primarily to permit complete sealing of oil gauge bushings, also indicates the proper oil level over a wide temperature range, eliminates the possibility of gauge glass oil leaks, and prevents sunlight from reaching the oil. In addition to this feature, O-B has made three other outstanding improvements in its oil-filled bushings—*all sizes* are positively and permanently sealed, more internal porcelain and a better voltage grading system are used in every size, and transformer units are provided with an interchangeable terminal system. To gain the many advantages of these exclusive features, be sure to specify "Bushings by O-B!"





A magnetized pointer follows an internal magnet which is actuated by a pivoted float. A non-ferrous metal partition between the dial chamber and oil reservoir maintains the bushing's positive seal.

Buy the Best ...Buy O-B

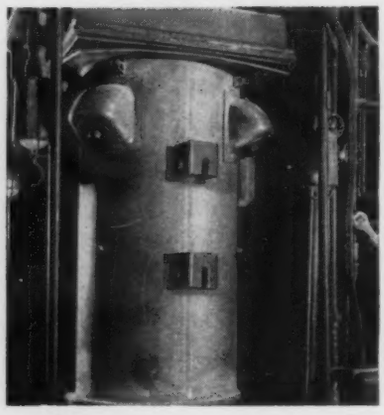
Ohio Brass

MANSFIELD, OHIO, U. S. A. 2232-H

Canadian Ohio Brass Company, Ltd., Niagara Falls, Ont.

REASONS WHY ENGINEERS CHOOSE THE NEW

1 Simplified Supports for Direct Pole Mounting Cut Installation Time. Standard Support Spacing and Bushing Location Mean Complete Interchangeability of All Sizes and Makes.



2 New, Durable, Copper-Bearing Steel Tanks. Tested Under Pressures Far Greater than Normal . . . Prevent Oil Leakage, Assure Long Life and Complete Safety.

3 New Spra-bonderizing Process . . . Plus Triple Coat Automobile Finish Give Tanks Positive Four-way Protection Against Attacks of Rust and Corrosion.

"I Like Its Six Big

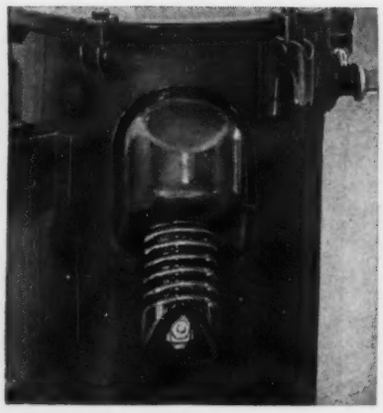
You'll Like The Engineering Advancements Built Into the New Allis-Chalmers Distribution Transformer to Give You Easier Installation . . . Greater Dependability . . . Money-Saving Operation!

It's here! The transformer you helped us design — the new Allis-Chalmers EEI-NEMA Distribution Transformer!

By pooling the knowledge of hundreds of operating men all over the country, it has been possible to design a transformer that makes your specifying and buying easier . . . a simplification

ALLIS-CHALMERS DISTRIBUTION

ALLIS-CHALMERS DISTRIBUTION TRANSFORMER



4 Extra-heavy Porcelain Coordinated Bushings with Liberal Creepage Offer Maximum Reliability Under Fog, Dust, Chemical or Other Adverse Conditions.

5 Double Conductor Insulation... Flexible Enameled Wire... Plus the Added Protection of Well-Lapped Cable Paper Provide Double Safety Against Winding Failures.

6 Improved Core and Coils, Liberally Designed with No Manufacturing Short Cuts . . . Mean Extra Years of Service-free Performance Under All Types of Operating Demands.

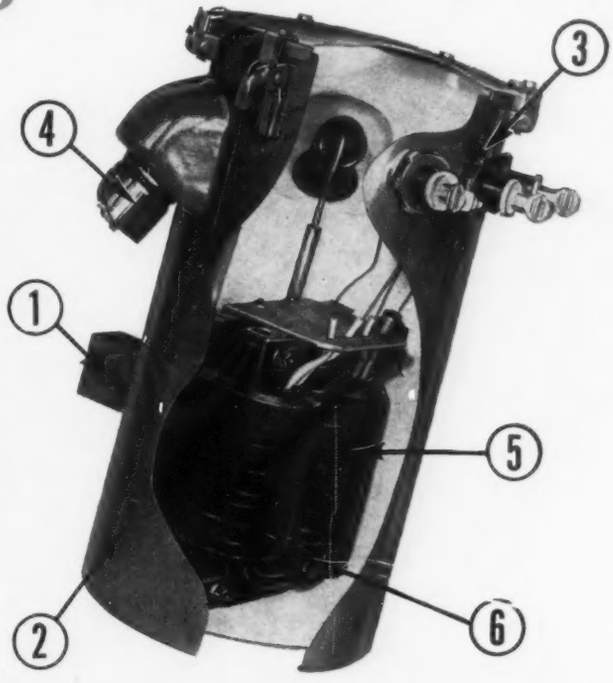
Engineering Features!"

that will undoubtedly save thousands of dollars, not only in first cost, but in operating expenses as well.

How is this done? By standardizing the location of supports and bushings, all sizes and makes are now completely interchangeable. This means you can get faster deliveries . . . easier installation. It also means fewer parts and fewer complete units for you to handle in stock.

Remember, too, Allis-Chalmers cuts no corners in its manufacturing process. Advanced engineering . . . plus the best material and skilled workmanship . . . give you built-in quality second to none.

For complete engineering information on the new Allis-Chalmers EEI-NEMA Distribution Transformer, call the district office near you. Or write for your copy of our new Bulletin B-6159. Allis-Chalmers Mfg. Co., Milwaukee, Wisconsin.

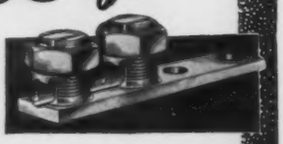


A-1382

TRANSFORMERS *Cut Operating Costs*

The MOST COMPLETE LINE OF *Terminal Lugs*

THOUSANDS of patterns — you can find the exact lug you want.

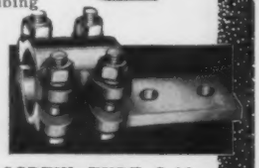


Penn-Union E-Z Lugs take a wide range of conductor sizes. Only 5 sizes of lugs for wire and cable from No. 6 to 1,000,000 CM. Self-locking; positive. Re-used over and over.

QUICK, SIMPLE INSTALLATION with the popular Penn-Union VI-TITE lug. Vise-like action gives a sure grip. Made in a wide range of sizes.

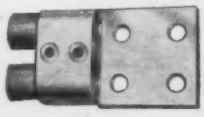
Fully approved *Soldering Lugs*, pressed from pure seamless copper tubing, and annealed. Also cast Heavy-Duty Soldering Terminals—and shrink fit lugs for copper tubing.

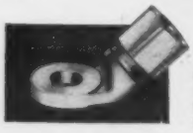
CLAMP TYPE terminals in widest variety. Straight or angle, for cable or tubing, with any desired contact tongue.



SCREW TYPE Solderless, easy to use and universally popular, especially in the small sizes. For both solid and stranded wires.

MULTIPLE CABLE terminals. We can furnish any style lug for two or more conductors.





SLEEVE TYPE terminals, with split contact sleeves, preferred by many large users. Made in many types.

See the Penn-Union Catalog for any kind of Terminal Lug — carefully made, thoroughly tested, *Dependable.*

Also the most complete line of Cable Taps, Service Connectors, Ground Clamps, Two-Ways, Tees, etc.

NORTHWESTERN AGENCIES
2411 First Ave., Seattle, Washington
F. M. NICHOLAS CO.
1123 Harrison St., San Francisco
KENNETH ANDERSON CO.
2115 So. San Pedro St., Los Angeles
Penn-Union Electric Corp., Erie, Pa.

PENN-UNION
Conductor Fittings

High Bay Bulb (1206)

A concentrating floodlite bulb designed for high bay lighting in industrial plants, auditoriums and stores with high ceilings, has been developed by the Birdseye Division of Wabash Appliance Corp. According to the manufacturer, the bulb is said to deliver a concentrated flood of light where high ceilings and traveling cranes or other obstructions

make impractical the installation of lights closer to the work plane. The filament is mounted at the exact focal point of the hump-shaped parabola of the bulb, so that light rays are forced straight out of the bulb without waste. Inside of the bulb is lined with polished silver to form a permanently brilliant reflector for the 1500-watt industrial size bulb.

Hotpoint Refrigerator (1207)

A 7-cu. ft. capacity refrigerator, Model EBX7, has been placed on the market by the refrigeration division of Hotpoint. According to the manufacturer, the model has proved popular because of the extra food storage capacity over the 6-cu. ft. model. A refrigerator has a 16-point temperature control, with semi-automatic defrosting. The unit is a 1-piece all-steel cabinet operated by the company's Thriftmaster unit which is vacuum-sealed, oil-cooled and permanently lubricated. An unloader valve permits mechanism to start and stop under no load, minimizing vibration and reducing operating cost.

Voltage Regulator (1208)

A metallic rectifier voltage regulator to use in conjunction with its line of standard metallic rectifier electroplating units has been developed by the Benwood Linze Co. The regulator is manually operated and designed to provide a convenient means for adjusting the voltage output of each individual or bank of rectifiers. It is available in a wall mounting cabinet designed to be installed adjacent to the plating tank away from the rectifier units. There are 64 steps of adjustments giving a voltage range from maximum to one volt and the coarse control covers the full range in eight steps. Another feature, according to the manufacturer, is that the regulator provides a start-stop station permitting remote control for starting and stopping and giving the operator complete control of each tank.

Crapo GALVANIZED STEEL STRAND

Combines All 4

1—HIGH STRENGTH
2—RUGGEDNESS
3—LONG LIFE
4—ECONOMY

All the inherent strength and ruggedness that steel alone provides are combined with long life and definite economies in *Crapo* Galvanized Steel Strand. Each size and grade develops the full tensile strength of the steel in its complete cross-section. The heavy, ductile, tightly-bonded zinc coating—applied by the famous *Crapo* Galvanizing Process—affords lasting protection against corrosion, extends the life of the strand beyond the normal period for replacement.

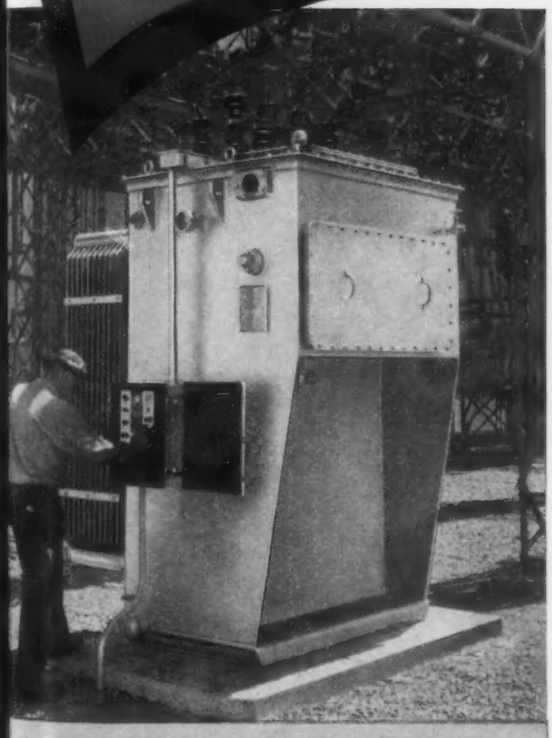
Low first cost, workability in the field, consistent, trouble-free performance and low maintenance expense characterize the service history of this time-tested product. There is a size and grade of *Crapo* Galvanized Steel Strand for every practical need. Consult the distributor of *Crapo* Galvanized Products near you or write direct for further information!

INDIANA
STEEL & WIRE CO.
MUNCIE, INDIANA

4,000,000 KVA REGULATED...

Not one contact replaced!

UNRETOUCHED PHOTOGRAPH OF Allis-Chalmers Type AFR Regulator contacts after 2,000,000 tap changing operations. Note the lack of appreciable wear.



ON THE LINES OF A FAR WESTERN UTILity — an Allis-Chalmers Type AFR 5/8% Step Regulator. Convenient location of all voltage control relay adjustments saves operators' time.

Allis-Chalmers 5/8% Step Regulators Set 100% Contact Life Record! Now You Can Get the Benefits of the Eight Years' Experience of the Pioneer Builder of Step Regulators!

4,000,000 kva regulated! Eight years on the lines! *And not a single contact ever replaced due to deterioration under normal operation!*

That's a 100% record — a record only Allis-Chalmers, the pioneer builder of step type feeder voltage regulators, can point to! But it's only one reason why more and more systems all over the country are specifying and buying Allis-Chalmers 5/8% Step regulators.

Here's another: All three-phase Allis-Chalmers Regulators now have unit type construction. That means *78 bolted connections have been eliminated!* There are no leads out of the oil . . . the unit can be untanked without disconnecting 39 tap leads or removing any terminals.

Important, too, the self-centering snubbing action of the quick-break mechanism gives you high-speed contact separation without the use of a motor brake. And maintenance costs are further reduced because the mechanism is completely oil-immersed . . . requires no lubrication.

For complete engineering information on the Allis-Chalmers Type AFR 5/8% Step Regulator, call the district office near you. Or write direct to Allis-Chalmers, Milwaukee, for your copy of Bulletin B6056. A 1441

These 5/8% Step Regulators Are Famous for Better Regulation at Lower Cost! Choose the Regulator to Fit Your Purpose!

DFR — 12 to 250 kva, single phase
AFR — 20.8 to 750 kva, three phase
CFR (air cooled) — 36-96 kva, 2400 volt, single phase

ALLIS-CHALMERS
MILWAUKEE·WISCONSIN

RUBBER COVERED POWER CABLES • BUILDING WIRE

CRESCENT

SYNTHOL TYPE SN

Made in Sizes 14 AWG to 4/0 AWG

SYNTHOL INSULATED WIRE is inherently moisture resistant, flame retarding, oil proof, sun proof, easy to fish, clean stripping, SAFE and PERMANENT.

SYNTHOL TYPE SN WIRES have the smallest outside diameter allowed by the National Electric Code, thus permitting more copper or more conductors with the same size conduit.

CRESCENT INSULATED WIRE & CABLE CO.

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CRESCENT
WIRE and CABLE

Factory: TRENTON, N. J.—*Stocks in Principal Cities*

LOS ANGELES
Tri-State Supply Corp.
544 S. San Pedro St.

SAN FRANCISCO
Hodges & Glomb
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KANSAS CITY
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CRESFLEX NON-METALLIC SHEATHED CABLE • SERVICE ENTRANCE CABLE • MAGNET WIRE • BARE WIRE

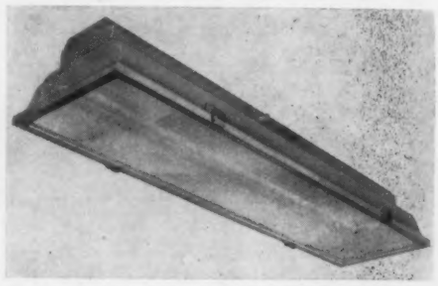
VARNISHED CAMBRIC • FLEXIBLE CORDS • LEAD ENCASED AND PARKWAY CABLES • ARMORED CABLE

CRESCENT ENDURITE SUPER - AGING INSULATION

In the front of the unit are two meters, one voltmeter and one ammeter to record current and voltage of each individual rectifier. By this method of control, it is claimed, all the convenience of an individual tank rheostat is obtained, and rheostat losses of bus bar control are eliminated.

Luminaire (1209)

A new 40-watt fluorescent luminaire is announced by Westinghouse Electric & Mfg. Co. to be known as Type FPS-40. The luminaire uses 2 or 3 40-watt fluorescent lamps per reflector and will provide lighting intensities of from 30 to 100 footcandles with maximum diffusion, minimum glare and uniform distribution at ordinary spacing and mounting heights, according to the manu-



facturer. Design of the luminaire makes it possible to construct any length of strip desired from 4 simple and compact types with channels providing a continuous wireway which may be mounted on conduit, messenger cable, twin-rod suspension or directly on the ceiling. All auxiliary equipment is mounted in the channel. Units have a twin-ballast with built-in compensators providing power factor of 90 percent or over.

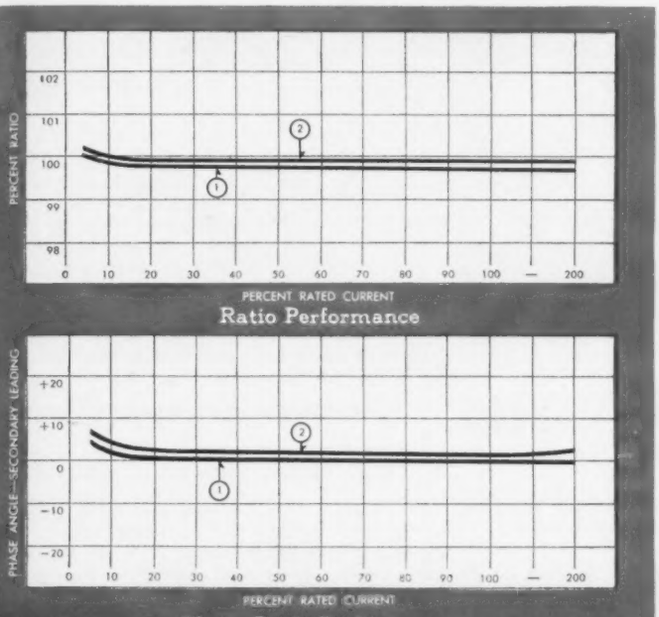
G-E F Devices (1210)

A manual starter switch and three new lampholders, designed to simplify use of fluorescent lamps in certain locations requiring special attention, has been announced by General Electric appliance and merchandise department. A new "Butt-on" fluorescent lampholder of a shallow-rotating lock type, accommodates Mazda "F" 14-watt to 40-watt lamps. Small socket dimensions permit only minimum shadows on the translucent fixture ends, as the unit is only 7/16 in. deep and 1¼ in. in diameter. It is equipped with 18-in. stripped fixture wire leads. A manual starter switch for F lamps is a combination manual switch and fluorescent lamp starter for use with portable lamps having two 14-watt, 15-in. Mazda F lamps in series with resistance ballast, or with desk lamps of one- or two-lamp design.

Blower, Convection Heaters (1211)

Edwin L. Wiegand Co. has developed convection and blower type unit heaters. The blower type heater is rated 1500 to 4,000 watts, for operation on 115 or 230 volts, 60 cycle, a-c and 115 or 230 volts d-c. Chromalox Koilstrip heating elements are used in conjunction with quiet cadmium plated fan, driven by enclosed type electric motor, providing an air temperature rise of 32 to 75 deg. F., at an air velocity of 130 to 180 F.P.M., depending upon rating. According to the manufacturer, the unit has a manual control switch (except d-c) and positive acting thermostatic switch in heater circuit for protection against over-heating if normal temperatures are exceeded. The convection heater, rated 1500 to 3000 watts, for operation on 115 or 230 volts, 60 cycles, a-c, and 115 or 230 volts d-c, has a feature of a curved baffle which efficiently discharges warm air generated by the heaters.

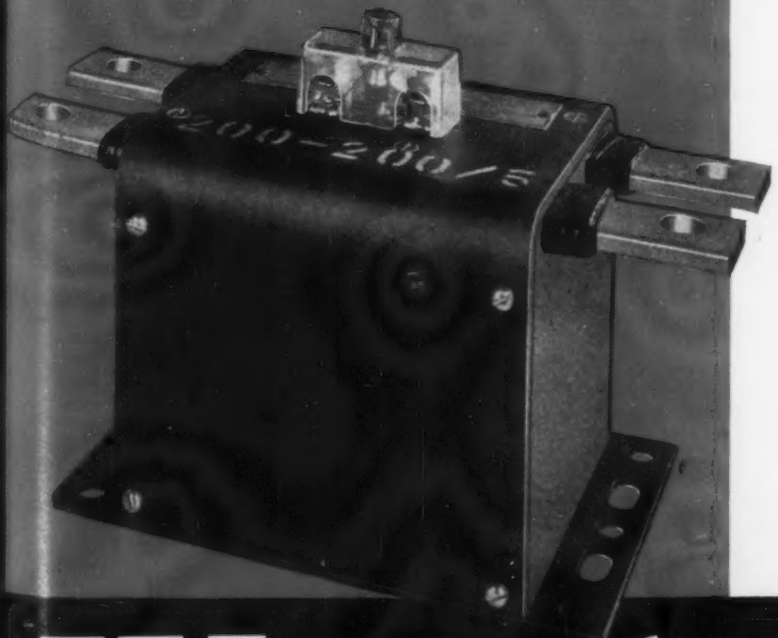
flat-line performance



Ratio Performance

Phase Angle Performance

CURVE No. 1—X Burden 0.1 ohms (2.5 V-A), 90% P.F.
CURVE No. 2—Y Burden 0.6 ohms (15 V-A), 90% P.F.
Accuracy Classification: X-¼, Y-¼



WITH ANY TYPE OF LOAD

Steady or fluctuating loads, balanced or unbalanced, all look alike to the new Westinghouse Type TW Indoor Current Transformer for 3-wire metering. Even if the primary current is all in one wire of the 3-wire circuit, performance is unaffected. Due to special permeability qualities of the Hipernik core, the ratio and phase angle curves are practically flat lines—from 15 to 200 per cent current.

IMPROVED APPEARANCE. Core and coils are now completely enclosed and protected in a neat streamlined Micarta case with satin black finish which does not collect dust and resists marring.

HIPERNIK REDUCES SIZE, WEIGHT. Over-all dimensions are smaller than previous models.

INSULATION GIVES EXTRA PROTECTION. It withstands the 30 kv impulse test and the 10 kv 60 cycle test. It resists the effects of heat under both normal and short circuit conditions. Windings and insulation will withstand a current 70 times normal for one second.

EASY INSPECTION is provided by the transparent cover enclosing the new type secondary short-circuiting device. Transformer rating is stenciled on the case in large, easy-to-read letters.

ALL TW RATINGS ARE INTERCHANGEABLE—same size mounting base, same size primary terminals, same over-all dimensions.

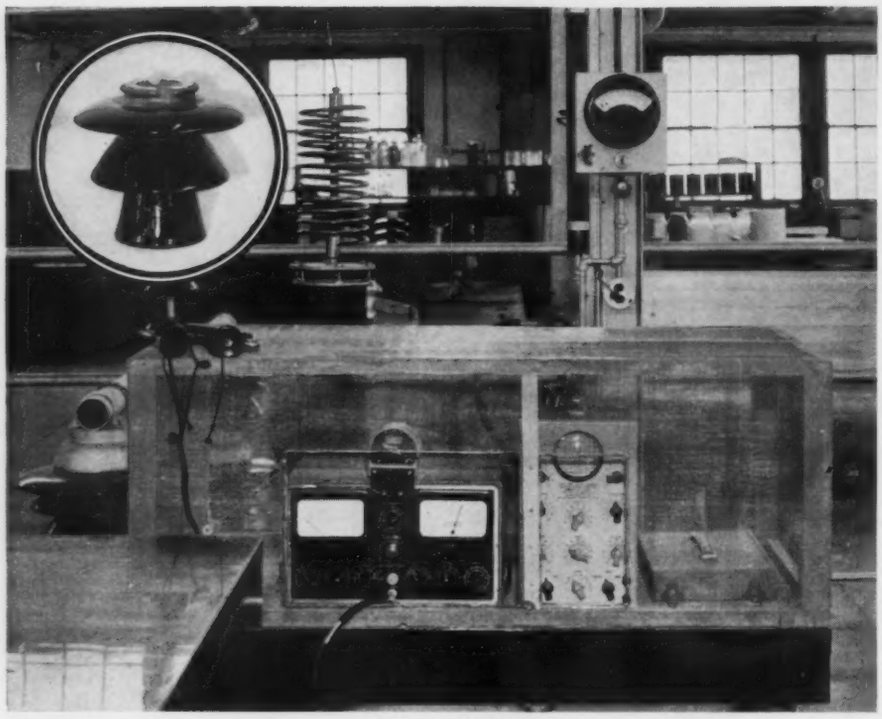
RATINGS COVER A WIDE RANGE—from 5-5/5 to 500-500/5 amperes in 18 ratings, 3-wire, for lines up to 1200 volts.

A Westinghouse man from our office nearest you will be glad to give you complete details—or we will send our folder 8634 on request. Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., Dept. 7-N.

J-70350

Westinghouse

TRANSFORMERS



At Victor we KNOW our Type "R" (Radio treated) Insulators Provide NOISELESS TRANSMISSION

Here's a machine that listens to insulators. Under conditions which duplicate the requirements of your lines, we put Victor Type R, radio-proofed insulators through their paces and check them with our Radio Noise Interference Detector. If there are any faults which would cause annoyance to a power company's customers—out they go . . . . Just one more reason for the growing preference for Victor Insulators, Type R.

V *The Mark of a* **GOOD** *Insulator*

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Portland

MAYDWELL & HARTZELL
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Phoenix

BULLETINS
data books, etc.

Keep Posted for 1c

Your being right up-to-the-minute may have an important bearing on your success. New developments are appearing daily in your field—tools to help you do a better job. Are you abreast of them? You fall back a step when the other fellow is well informed about a subject of which you are ignorant. Manufacturers' publications are a quick, efficient way for you to keep posted on current events in your field.

Isn't it a bargain to invest 1c (the cost of a postcard) to help earning power to which you look forward? American industry is offering a remarkable service—free. ELECTRICAL WEST makes it easy for you to enjoy this service for your own. Check and mail the coupon below. That's all you have to do to help yourself toward better performance and greater rewards.

Electric Door Chimes (1212)

Edwards & Co. have published a catalog on their current line of electric door chimes featuring a chart which serves as a guide in selecting the proper chime for any type of decorative scheme.

Glass-enclosed F Units (1213)

Glass-enclosed fluorescent lighting units are described in a bulletin issued by the Wiremold Co. which gives data on specifications and assemblies and power factor. The bulletin illustrates various units with a cutaway drawing showing the dimensions.

Fan-type Heater (1214)

A folder on their fan-type unit heater has been published by Westinghouse Electric Supply Co. which pictures the various units and gives their specifications and prices in tabular form.

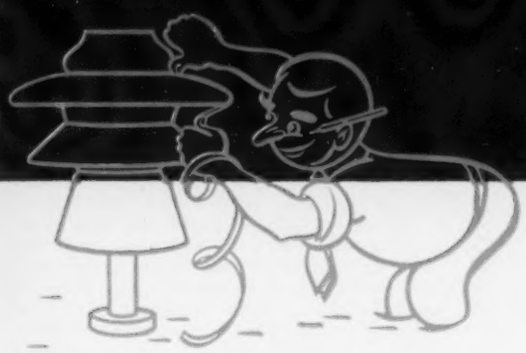
G-E Transformers (1215)

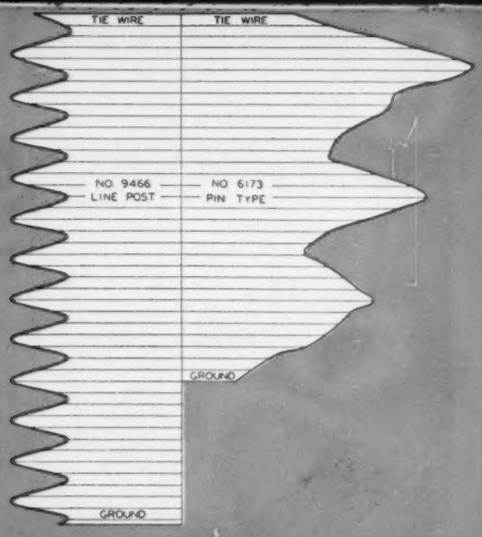
Describing the complete General Electric line of outdoor-type current and potential transformers of 15 kv. and below, a new bulletin contains in tabular form insulation characteristics, accuracy classifications, ratings and prices of various units. According to the bulletin, all transformers listed conform to the proposed American Standards Association insulation requirements.

Bristol Lines (1216)

A bulletin on Bristol Company products and description of their engineering services is offered by that company. The bulletin covers air-operated and electrically-operated automatic control instruments, recording and indicating instruments, and telemetering instruments for recording and remote automatic control.

WHAT'S LEAKAGE DISTANCE TO A HIGH-VOLTAGE INSULATOR ?





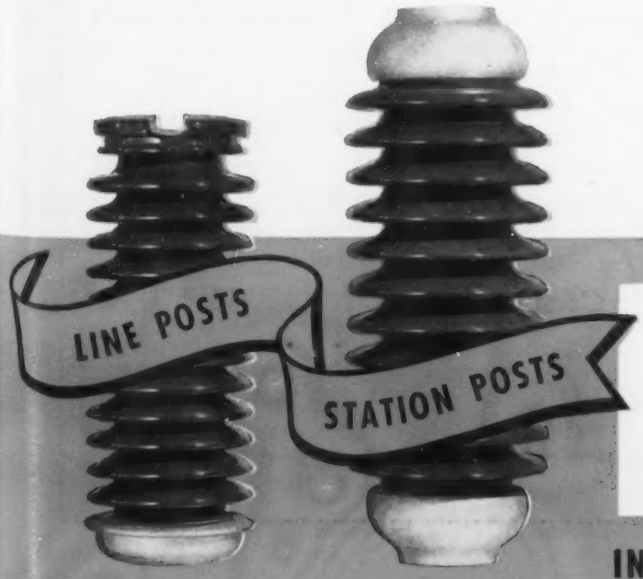
Developed leakage surfaces of a conventional 66 Kv pin type insulator (right) and the comparable Line Post (left). The two figures graphically represent the leakage paths of insulators in service. Conductivity per unit length at any point is proportional to the radius. Figures approximately 1/16 scale on length, 1/4 scale on radius. The variation in conductivity between maximum and minimum points is 3.6 times as great on the pin type insulator as on the Line Post. Note on the conventional insulator the four narrow points which, under bad conditions, blow up into gaseous arcs, precipitating flashover. Contrast with the uniform leakage path of the fog type surface.

Standard practice in specifying an insulator is to determine, among other things, the leakage distance offered. Lapp Line Posts and Station Posts are known for the extra length of leakage path they offer. No less important, however, is the consideration of the *nature of the leakage path.*

The fog-type design made famous by Lapp Post insulators develops a leakage distance on the principle of *uniformity.* That statement has significance when we consider the nature of leakage flashover in conventional units. The insulator has a contaminated surface which is not uniform —in thickness, width or moisture content. Rain and wind partially clean the exposed parts, do not reach those shielded. Resistance of the wet part is lowered. Since the total resistance is reduced, more current flows but it must flow over the entire insulator, from live terminal to ground. Because of the lowered resistance of certain parts the voltage necessarily piles up over the other parts (near the pin and between shells where narrow and dry). Finally a condition obtains where the narrow shielded section flashes, precipitating flashover of the complete unit either by the arc spreading out or due to added duty on the other parts of the insulator.

The Lapp Post design offers fog-type petticoats open to the cleaning action of wind and rain. Rain falling on one petticoat splashes to flush out the under side of the petticoat above. Contamination washes away uniformly and leakage current falls rapidly. Under light rain or fog when flashover is most probable, as the resistance falls the leakage current rises. The watts dissipated are more uniformly distributed over the entire insulator, drying it more uniformly and holding down leakage current to a safe value. An insulator with a non-uniform surface inevitably dries in a non-uniform way, establishing dangerous hot spots.

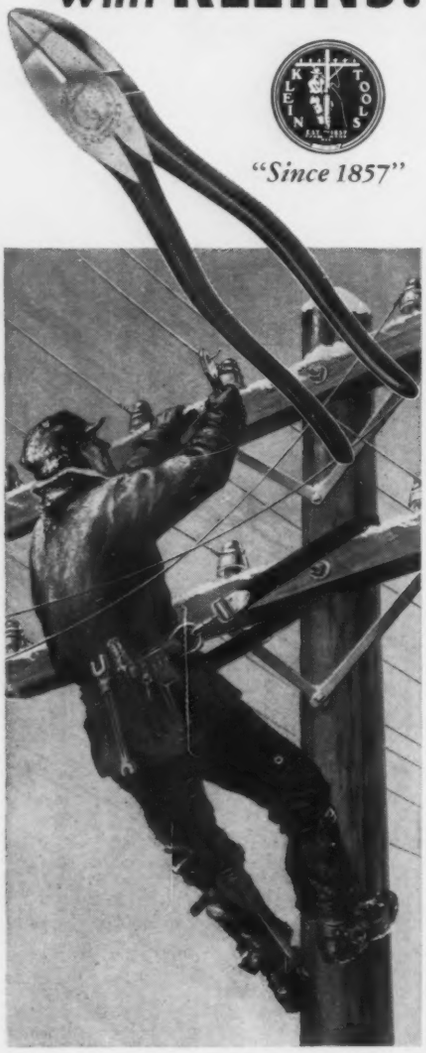
Lapp Line Posts and Station Posts installed in the most notoriously contaminated atmospheres in the country have proved, without exception, to give service superior to any pin-type or suspension units. The usual result has been the complete elimination of the need for cleaning.



LAPP

INSULATOR CO., INC. • LEROY, N.Y., U.S.A.

EQUIPPED FOR ANY EMERGENCY *with* KLEINS!



"Since 1857"

WINTER'S a tough time for any line job, but when wires go down it's up to the lineman to restore service —in a hurry. The pliers, the strap that holds him safe, the tools in his belt and the very belt itself—all make his task easier—when they are Kleins.

Your copy of the Klein Pocket Tool Guide will be sent on request.

ASK YOUR SUPPLIER

Foreign Distributor:

International Standard Electric Corp., New York

Mathias KLEIN & Sons Established 1857 Chicago, Ill. U.S.A.

3200 Belmont Avenue, Chicago, Illinois

Core and Coil (1217)

Core and coil construction of Allis-Chalmers circular coil, shell type high voltage power transformers is described in a new 20-page bulletin released by that company. The bulletin features cutaway section of a typical transformer, showing detail of construction.

Switch Houses (1218)

Metal enclosed outdoor switch houses are treated briefly in an 8-page Allis-Chalmers release which is primarily pictorial, showing switch house dimensions by means of charts and tabular listings.

Fuse Links (1219)

W. N. Matthews Corp. has issued a bulletin on fuse links containing information including currents in amperes, fusing charts and fuse coordination tables.

Pacific Units (1220)

Pacific Electric Motor Co. has issued a house organ bulletin illustrating and describing various units constructed by the company and showing numerous views of the company's plant and offices.

D-H Presents (1221)

Driver-Harris Co. has issued news of various D-H products in house organ form. Featured is the installation of a rotary spiral annealing furnace, containing Chromax retorts made by Driver-Harris. Also included is a photograph showing D-H life tests on metallic resistor materials.

National Defense (1222)

A striking, colorful booklet has been produced for the Pennsylvania Transformer Co. on the general subject of national defense. Transformers manufactured by this company are tied into the theme by means of pictures of various installations together with technical descriptions of the production involved. Nationally-known power projects, large industrial installations are primarily featured in the book.

Induction Motors (1223)

Lo-Maintenance induction motors is the subject of a new Allis-Chalmers 8-page bulletin which summarizes types of low-maintenance induction motors and their applications. Photographs of the various motors, together with their ratings, is a feature of the release and mechanical advantages of the units are outlined. Sizes and prices and dimensions are given accompanied by vertical drawings of the units. The features of the booklet are actual installation photographs of Allis-Chalmers motors.

Portable Electroplater (1224)

W. A. Hesse & Company have issued a bulletin featuring their portable electroplater which has a comparatively new feature in that connection with these plating outfits is the mop style plating anode cover which displaces the plating brush for use on irregular surfaces and is said to be faster in depositing metal.

Oil Circuit Breakers (1225)

A 4-page bulletin on oil circuit breakers of 2000 amp. or less, 15,000 volts, 100,000 kva. interrupting capacity, has been published by Allis-Chalmers Mfg. Co. and describes these units by means of cross section diagrams and actual photographs of the breakers, explaining features in the accompanying text. Also included in the bulletin in tabular form are listings of maximum current, voltage and interrupting capacity ratings. A reference on general dimensions is also featured by means of a scale drawing.

Air-Cooled Transformers (1226)

General Electric air-cooled transformers of 600 volts and above are described both pictorially and in text in an 8-page bulletin which features cutaway drawings of the transformers to show their mechanical advantages.

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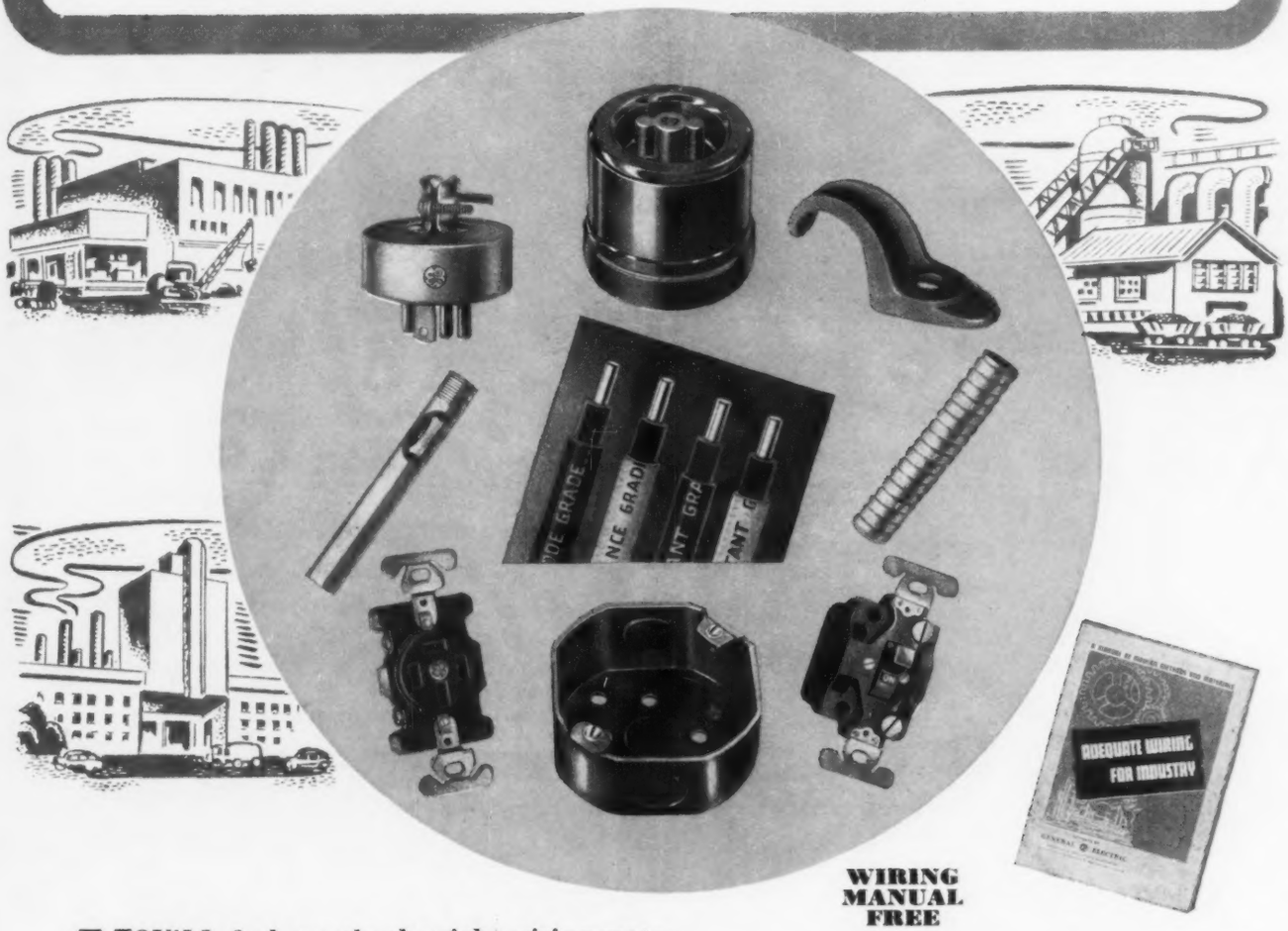

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General Electric has prepared a manual called "Adequate Wiring for Industry" which describes modern wiring methods and materials. You'll find it helpful in checking and planning industrial wiring. The manual interprets wiring in terms of savings and service.

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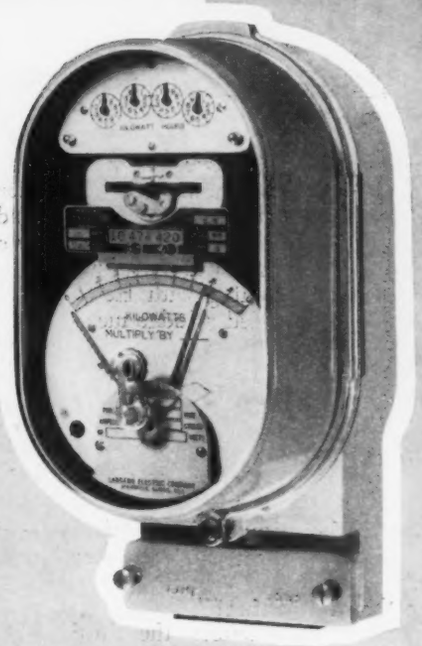

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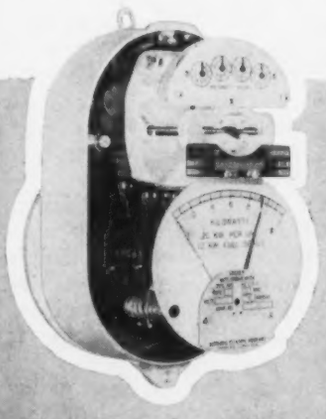
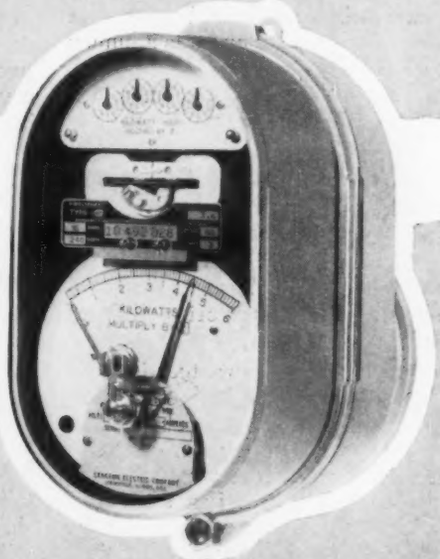


Type JWS, Cover Removed



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LINCOLN METER DIVISION
SANGAMO ELECTRIC COMPANY SPRINGFIELD ILLINOIS

ELECTRA'S HUSBAND

Kilowatts and Waffles

"And what did you two dames do all evening without the pleasure of our masculine company?" I teased Electra as we drove home from the Marshall's house where she had spent the evening with Helen while Bob and I attended a lodge meeting.

"Oh, we didn't even miss you," Electra replied airily. "We spent a very interesting evening reading letters."

"From whom?"

"From power company customers. They were written in a contest about what they receive from their electrical service. Jim had them at home for judging."

"Were they interesting?"

"Applied to those letters, the word 'interesting' is an exaggeration of understatement. They were some of the most engrossing messages I have ever read. Practically every one was a human interest story, packed with the happiness and sorrow and struggle that makes up living. Some made us laugh and more than one tugged at our hearts."

"All this drama about electricity?" I interrupted.

"Yes, every bit of it," Electra asserted. "Evidently electricity enters into the writers' daily lives so closely that talking about it reveals stories full of feeling."

We were at home now, toasting our toes before the heater before retiring. Electra reached down to rub the cat between the ears as she went on, "One of the letters was from a young wife, whose electric bill was just something she paid every month until her baby came. Now she calls electricity her little son's guardian angel. It keeps his food fresh and free from germs, washes and irons his clothes, warms his bottle and lights her way to his crib when she hears him cry in the night.

"There were lots of letters from elderly people who lived in 'the good old days' when there wasn't any electricity. They see electric light as the clean, convenient substitute for the kerosene lamp that soiled their hands, offended with its odor and had to be constantly filled, trimmed and cleaned. Behind their refrigerator they remember themselves balancing one dish on top of another as they carried food down the dim stairs to the musty cellar for refrigeration of a sort. An electric range reminds them of the piercing heat given off by the stove that made the whole house seem like an oven on summer days. They can still feel their backs ache from carrying in wood and coal to a box that, no matter how often they filled it, seemed always empty.

"You know how people dread giving up their independence because of advancing years? One letter was written by an 85-year-old woman whose washing machine, iron, vacuum cleaner and refrigerator simplify her work so greatly that she can do all her own housework and care for her invalid husband without becoming a burden on her children.

"There were lots of other letters from old folks, written by shaking, rheumatic hands in pencil on lined tablet paper that probably was the only stationery in the house. I can imagine them sitting down at the dining room table, pushing aside the bright scarf that covers it between meals, and brightening their humdrum day by writing to the power company.

"There was a sweet letter from two little girls who like to romp in their lighted back yard after dinner. They have a lifesized play house which their daddy lighted with real electric lights. And their mother has more time to share their play since she has had an electric range. Are you still listening?"

"All appearances to the contrary notwithstanding, I am not asleep," I replied. "I shut my eyes because I listen better that way."

"Well, don't shut your ears because there is lots more. One husband and wife see in their electric bill the fun of playing ping-pong in their lighted yard. We could almost feel the cool night air and see the white balls bouncing back and forth as we read how they improved their health and reduced their weight by engaging in this home sport that electricity makes possible.

"An anxiety-filled sick room was pictured in a letter from a mother whose little daughter, ill with pneumonia, was saved by an electric heating pad and electric heat in the room. Another mother sees a typical American family behind her electric bill—a woman who isn't too tired to smile, a man who still looks forward to coming home at night to his wife and happy, well kept children.

"One of the most touching messages came from a brave, uncomplaining housewife of very small income. Her refrigerator does a good job of keeping what fresh foods they can afford to buy, and she prizes her waffle iron highly, although at present it is on vacation until eggs come down in price.

"In the clean clothes billowing in the breeze and the stacks of fragrant, freshly ironed clothes one housewife thrills to the banishment of the nightmare that used to be laundry day. Another woman sews for a living and appreciates having electricity to run her machine. All too well she remembers her aching shoulders and tired legs at the end of a day at a foot treadle machine.

"A man's devotion to his family was shown in another letter. He said it meant a lot to him to know that electric heat, electric cooking, water heating and the like were protecting his wife and children, whom he prizes above all things in the world.

"Other letters told how electricity brings welcome radio entertainment to a boy who has been ill for many months . . . how it gives folks living in the country, high in the mountains or far out on the desert city conveniences, and assists the many wives who work during the day to do a good job of keeping house."

Electra fell silent and I opened my eyes.

"Didn't anyone talk about the power company's generating plants and its vast operating system?" I questioned. "And the monumental taxes it pays, its large number of stockholders, customers and employees—didn't anybody write about them?"

"Yes, a few people," Electra said, "but they were so few in proportion to the rest that they were definitely in the minority. The great majority of entries in the contest were plain, folksy letters about what electricity does for the writer personally."

"It sounds like a kilowatt-hour isn't nearly as important to the average person as the delicious brown waffle baked in his waffle iron. That is in line with the fact that the word 'I' is the most frequently used in the English language because people are concerned most with the things that concern themselves." I yawned, "Well, I have a big day ahead of me tomorrow. Let's turn in."

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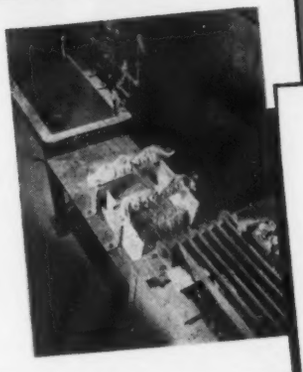
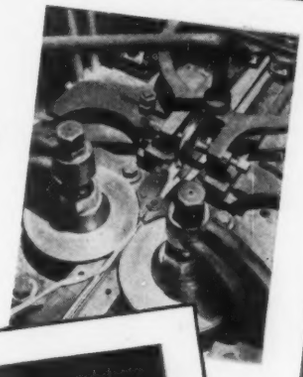


3 Foot-by-foot inspection of the insulation strips before and during their application to the wire.

4 Perfect centering of conductors by the Okonite strip-insulating process.



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About the New 1942 General Electric Refrigerators?

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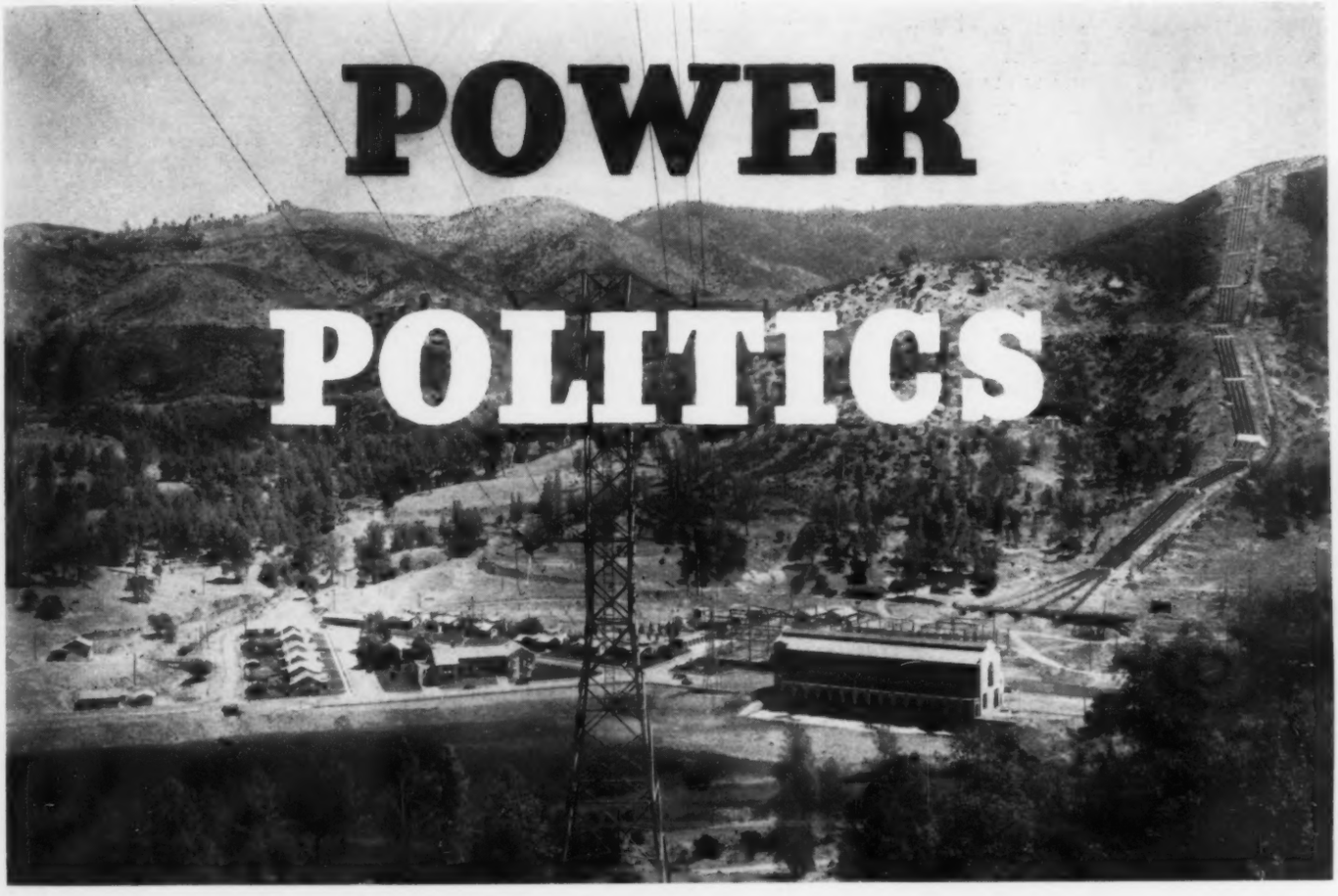
And as always, G-E dealers will have the rich sales reservoir of the complete line of G-E Appliances to draw upon.

GENERAL ELECTRIC

ELECTRICAL WEST

VOL. 87 NO. 6
DECEMBER, 1941



POWER POLITICS

R. W. Jimerson

Political Editor, San Francisco "Examiner"

CREATION of a public-ownership super-power empire in northern California received a decisive—although by no means conclusive—setback on November 4, when San Francisco voters defeated a $66,500,000 revenue bond issue to put the city in the electric distribution business.

Defeat of the revenue bond proposal was the eighth of its kind in San Francisco, a city which has its own $185,000,000 water system, its own municipal railway, and one of the nation's finest municipal airports.

In spite of—or perhaps because of—these previous ventures in public ownership, San Francisco repeatedly has turned a cold shoulder to proposals that it embark in the public power business. Defeat of this eighth proposition occasioned no surprise, and would warrant no extended mention were it not for certain collateral facts indicating that the issue has ramifications bulging far beyond San Francisco in space, and long before 1941 in time.

These ramifications may be observed for himself by any moderately imaginative reader who peruses the chronological record which follows. For readers unfamiliar with the background of what many San Franciscans still naively believe to be a local issue, a few words of explanation may be in order.

The Raker Act, passed by Congress and approved December 19, 1913, gave San Francisco (for valuable considerations) certain rights in Yosemite National Park and the Stanislaus National forest. These rights enabled San Francisco to construct its Hetch Hetchy water project. Electric energy is a by-product of the water project, and Section 6 of the Raker Act prohibits the city ". . . from ever selling or letting to any corporation or individual, except a municipality or a municipal water district or irrigation district . . . the water *or electric energy*. . . ."

In 1925, when power from the Hetch Hetchy project became available, the city found itself with a power plant and no market. Its appeal for help resulted in an "agency contract" with the Pacific Gas and Electric Co., under which the power was delivered to the company for re-sale.

The Supreme court has held that this agency agreement with the company violates Section 6 of the Raker Act. There is no inference in the record, and no inference is intended, that the Federal courts were actuated in any degree whatever by political considerations in reaching their conclusion.

Another fact, the most tangible and probably the most important, is the mighty concrete monolith now taking form across the Sacramento River above Redding, Calif., which when completed will be the Shasta Dam.

Below the dam will be a hydro-electric plant, capable of delivering 375,000 k.w., a luscious public-power plum worthy to rank with TVA, Bonneville, Boulder, and Grand Coulee.

Public power advocates in Washington and California, of course, want this huge block of power distributed through public ownership channels.

However, northern California as a whole, as well as San Francisco, has been reluctant to embark on public power distribution projects. A few municipalities have their own systems, and

various small power districts have been formed. But for the most part the name of the Pacific Gas and Electric Co. is synonymous with power from the Tehachapi Range almost to the Oregon border.

The nightmare of public ownership politicians is fear that Shasta Dam power will have to be sold to the Pacific Gas and Electric Co., for lack of publicly-owned outlets to absorb it.

Was it a politician who first observed that there is more than one way to skin a cat?

And so we start the record in 1935, when details of Central Valley Project financing by the Reclamation Division of the Department of the Interior were being completed, and preparations were under way for turning the first shovelful of earth at Kennett, site of the Shasta Dam:

MAY 2, 1935—San Francisco votes down a charter amendment permitting issuance of revenue bonds for acquisition or extension of public utilities. Yes, 50,804; No, 72,780.

AUGUST 24, 1935—Secretary of the Interior Harold Ickes rules that San Francisco's sale of Hetch Hetchy power to the Pacific Gas and Electric Co., under the so-called agency contract, is in violation of the Raker Act.

(This contract had been in effect for 10 years, and its legality was never officially challenged until Ickes' ruling. The city, however, had repeatedly submitted power-bond proposals during this decade, but all attempts to provide for municipal distribution of the power were defeated at the polls.)

MARCH 9, 1937—San Francisco votes down a $50,000,000 revenue bond proposal for purchase or construction of a municipal distribution system for Hetch Hetchy power. Yes, 65,762; No, 78,101.

MARCH 29, 1937—Secretary Ickes issues ultimatum that if the Board of Supervisors does not take action within 15 days to comply with the Raker Act, he will ask the Attorney-General to bring court action for cancellation of the Hetch Hetchy power contract.

APRIL 2, 1937—Without further conference with city officials, Secretary Ickes asks the Department of Justice to file suit to enjoin the city from disposing of Hetch Hetchy power through the Pacific Gas and Electric Co.

APRIL 27, 1937—U. S. District Attorney H. H. McPike of San Francisco files an injunction suit.

APRIL 11, 1938—U. S. District Judge Michael J. Roche issues an injunction, effective as of December 28, 1938, and holds the agency agreement to be a violation of the Raker Act.

JULY 9, 1938—Secretary Ickes telegraphs Mayor Angelo J. Rossi, during an acrimonious exchange, that the city's program in connection with Hetch Hetchy power "obviously does not permit the inclusion of the power project in the Public Works program."

Interpreting this as a threat to deprive San Francisco of further PWA assistance, Mayor Rossi wires back: "I cannot understand your stubborn and dictatorial attitude toward the good people of San Francisco, and particularly our unemployed."

NOVEMBER 8, 1938—The Garrison Revenue Bond Act, which would permit any city, county, municipality, or district to issue revenue bonds by a mere majority vote, to finance any kind of public utility, is defeated at the State general election by nearly three to one. Yes, 516,591; No, 1, 465,841. San Franciscans vote against the measure in almost the same ratio. Yes, 50,410; No, 135,773.

At the same election, State Senator Culbert L. Olson, Democrat, New Dealer, advocate of public ownership and a supporter of the Garrison Act, is elected governor.

DECEMBER 20, 1938—Judge Roche grants the first of several postponements which ultimately extend the date when the injunction becomes effective to June 30, 1942.

JANUARY 2, 1939—Governor Olson, in his inaugural address, says: "In this field of public utilities I see no justification for pyramiding private corporations owning or controlling the natural resources of the state and exacting tolls and profit, often exorbitant, out of a business which should be no more than a non-profit service to the general public for its health, comfort and welfare. . . . This administration will, in all possible directions, further public ownership and operation of public utilities."

MARCH 23, 1939—Secretary Ickes is quoted in Washington dispatches as suggesting that the Federal government might take over the Hetch Hetchy power plant.

(This suggestion was repeated many times during the next two and a half years, and by responsible official sources, despite the obvious illegality under the Federal constitution of seizing a plant built and owned by the City of San Francisco, standing on city-owned land.)

MAY 19, 1939—San Francisco votes down a $55,000,000 revenue bond issue for acquisition or construction of a municipal distribution system for Hetch Hetchy power. Yes, 50,283; No, 123,118.

JUNE 20, 1939—Over the "all-out" efforts of the Olson administration, the Legislature defeats the Pierovich bill, which would "unfreeze" $170,000,000 in Central Valley Project state bonds. This is pre-eminently the major battle of the 1939 legislative session.

(The bonds, authorized but never issued because the Federal government is financing the project, were earmarked exclusively for "water" purposes. The Pierovich bill would have permitted sale of the bonds and use of the proceeds for financing any type of publicly-owned utility, particularly power projects.)

JUNE 25, 1939—Congressman Tom Rolph (San Francisco) introduces a bill to amend the Raker Act.

(On January 22, 1940, in a letter to Hon. Alva B. Adams, Chairman of the House Committee on Public Lands and Surveys, Secretary Ickes wrote: "I recommend that the bill be not enacted.")

The bill subsequently dies in committee, as does a companion bill introduced in the Senate by Senator Hiram W. Johnson.

OCTOBER 26, 1939—Governor Culbert L. Olson, speaking in San Francisco before the Western Conference on Governmental Problems, says: "I am convinced that we can take this fullest advantage of giant power, of the most modern techniques, by eliminating high interest rates and private profits; a combination that is possible only under public ownership. . . . We are now engaged in a fight for this accomplishment against the well-known methods of obstruction and delay practiced by private interests engaged in public utility business."

NOVEMBER 7, 1939—President James B. Black of PG and E formally offers, on behalf of the company, to absorb the capacity of the Shasta plant of the Central Valley project up to 400,000 hp. during the first five years of its operation, at a price which, he estimates, "will exceed the price paid to the United States government for the output of power at Boulder Dam and the price provided in the schedules recently established for the sale of power at the Bonneville Dam in Oregon."

APRIL 22, 1940—The United States Supreme Court holds the Hetch Hetchy agency contract invalid and in violation of the Raker Act, upholding Judge Roche.

AUGUST 18, 1940 to MAY 22, 1941—Secretary Ickes rejects all proposed leases between the City and PG and E.

MAY 27, 1941—Secretary Ickes agrees to a suspension of the injunction to June 30, 1942, if the City will hold a bond election in November, for acquisition of a municipal distribution system. He stipulates conditions under which election must be held, requires that the plan be submitted to him in advance for approval. These conditions are met, and the Board of Supervisors orders a $66,500,000 power bond issue placed on the ballot at the November 4 municipal election.

MAY 29, 1941—The Pacific Gas and Electric Co. applies to the Federal Power Commission for permission to construct additional generating plants at Cresta and Pulga, on the North Fork of the Feather River. The plants are estimated to cost $18,840,000, with another $50,000 for transmission line links.

A FEW WEEKS LATER—The Water Project Authority of the State of California, controlled by Governor Olson, protests "against construction of any plants on the North Fork of the Feather River until the Central Valley project is completed and the power output absorbed into the market of northern and central California." The Water Project Authority specifically asks "that the license for the Cresta and Pulga units be denied."

NOVEMBER 5, 1940—The Federal Power Commission issues ruling denying the permit. It holds that "it appears that it would be prudent to provide additional generating capacity" and that such construction "is justified by present prospective increase in the market demands in the area served by the applicant." The permit is denied, however, on the grounds that the application does not include use of the storage reservoir at Lake Almanor.

DECEMBER 2, 1940—PG and E files an amended application including the Lake Almanor Reservoir as part of the project. The State Water Project Authority again protests the granting of a permit.

FEBRUARY 19, 1941—Federal Power Commission grants the amended application for the Cresta and Pulga permits. It holds, in part, that a survey of ". . . power requirements of the area served by the applicant, *including power needed for the defense program*, and of the available sources of power to supply that load, indicate *a definite lack of generating capacity by 1943* in that area unless additional facilities are constructed.

"Because of the *uncertainties now apparent with respect to the time when the Shasta*

power plant will be able to supply any substantial portion of the power load in this area, and the increasing difficulty in securing commitments by generating equipment manufacturers . . . . *it is imperative* to make provision for construction of these two additional generating plants *without further delay.*"

(At the request of the office of Secretary Ickes, the permit contained a proviso that "no transmission line covered by this license shall be utilized for the transmission of electric energy developed at the Hetch Hetchy project and disposed of in violation of Section 6 of the Raker Act.")

The Federal Power Commission ruling officially takes cognizance of "*the national emergency* now existing as proclaimed by the President of the United States on September 8, 1939, and the vital importance of assuring that adequate supplies of electric power will be available to industries essential to the national defense."

PG and E, at the commission's request, pledges itself to "do everything within its power to complete construction of the Cresta and Pulga developments within the times fixed by the commission." The company promptly places orders for more than $1,000,000 worth of new equipment for the two plants.

FEBRUARY 19, to APRIL 10, 1941—The California state administration continues its efforts to block Cresta and Pulga developments, in spite of the Federal Power Commission plea that new generating capacity be added without delay, as a national defense safeguard.

Secretary Ickes asks a Federal appropriation of $20,000,000 to build a steam plant at Antioch for firming Shasta power. The State Water Project Authority joins in the request, declaring such a plant would care for additional power needs and Cresta and Pulga would be unnecessary. Congress has not as yet taken action.

PG and E asks the Federal Power Commission to modify its Feb. 19 order to give the Cresta-Pulga permits a life of 50 years, instead of 35 years.

APRIL 10, 1941—The Federal Power Commission orders PG and E to show cause why the Feb. 19 permit should not be revoked, charging that the company had withheld information as to certain other new construction.

(Actually, the new construction—the enlargement of a steam plant near Richmond, to care for oil refinery needs under a State Railroad Commission permit—had been explained to the FPC San Francisco office. The re-hearing was set for April 28.)

JUNE 2, 1941—Following the re-hearing, the Federal Power Commission rules as follows:

1—Denies the 50-year permit and re-affirms the 35-year term, although it means higher rates because of the shorter period for amortizing costs.

2—Re-affirms the Cresta and Pulga permits but with a NEW provision which—

3—Has the effect of "freezing" the company's generating capacity at the new level. EXCEPT on approval of the FPC.

(This meant that even in a purely intrastate development unconnected with the Federal domain, the PG and E would be forced to get Federal authorization.)

LATER IN JUNE, 1941—The company refuses to accept the new Federal Power Commission conditions, declaring they would lead to "an intolerable conflict of authority between Federal and State governments," and announces it will proceed with construction of new generating capacity on the Pit River, under an old permit from the State Railroad Commission.

JUNE 21, 1941—The Federal Power Commission, after "further consideration" of its June 2 order, "modifies" its ruling somewhat. In effect, however, a Railroad Commission order still would require ratification by the Federal Power Commission before becoming effective (in a PG and E application.)

JULY 25, 1941—Governor Olson asks President Roosevelt to make available immediately funds for the proposed Antioch steam plant, in view of what he terms "arbitrary refusal" of PG and E to accept conditions that are "reasonable and proper in view of the present national emergency."

JULY 25, 1941—Governor Olson writes President C. C. Baker of the State Railroad Commission that he hopes to avoid a jurisdictional quarrel between State and Federal agency; that he is "sure" the Federal Government has no disposition to interfere with legitimate state jurisdiction; and asks for "co-operation" from the state commission.

JULY 29, 1941—Baker, replying to Olson and reviewing the Cresta-Pulga situation, points out that the Federal Power Commission on June 2 granted a permit, and added: "At that point, as understood by this commission, it appears that certain officials in high position in this state elected to appear in Washington, some in person and others indirectly, in opposition to such grant of license to the Pacific Gas and Electric Co."

Declaring that the State Railroad Commission would endeavor to co-operate with Federal Agencies, Baker continues: "It may not be inappropriate to add here, however, that some of us are lacking the optimism we would prefer to feel and to exhibit. For instance, among other things, it has been noted from Washington dispatches, as of the 24th instant, that Secretary Ickes, as of a recent date, severely castigated the Federal Power Commission as to various particulars, expressing himself, in part, thus:

" 'It does not suit this department at all. As far as we are concerned, before Mr. Olds (Leland Olds, Commission Chairman) makes recommendations on areas in which we operate we should be consulted. Some recommendations were very ill advised.'

"And it would further appear from certain dispatches from Washington that the present relations between Mr. Ickes and the OPM are anything but harmonious."

AUGUST 18, 1941—Federal Power Commission issues order for series of hearings to determine jurisdiction. Meanwhile, Cresta and Pulga developments are abandoned by the company; final decision on Pit River plant awaits FPC ruling: expected within few weeks.

JULY 1, 1941, AND AFTER—Campaign is organized for and against the $66,500,000 power bond issue on San Francisco municipal election ballot for November 4.

Governor Olson, in a Sacramento press conference, expresses hope that the bonds will pass.

SEPTEMBER 7, 1941—The Securities and Exchange Commission, over-riding report of its trial examiner, holds that the Pacific Gas and Electric Co. is a subsidiary of the North American Company, and is therefore subject to SEC regulation.

(The trial examiner held that North American's 18 per cent of stock ownership did not warrant a decision claiming control. The fact that PG and E has 25,000 stockholders in San Francisco was not mentioned.)

SEC ruling comes at strategic time to use in campaign.

OCTOBER 13, 1941—Typical use of SEC ruling is made in published statement by Mayor Rossi, in behalf of the bond issue. He says: "It is perfectly obvious that amendment of the Raker Act will benefit nobody except the stock and bondholders of the PG and E and 52 per cent of these are *eastern financiers and capitalists.* Why should great holding corporations make these rich profits at the expense of San Francisco electricity consumers? Why should we pay high power bills to make these fat dividends possible?"

OCTOBER 17, 1941—An Associated Press dispatch: "Hyde Park, N.Y., Oct. 17—(AP)—Passage by Congress of an act to let the City of San Francisco distribute power from the Hetch Hetchy project through the Pacific Gas and Electric Co. was described by President Roosevelt today as the height of improbability.

"Under the Raker Act of 1913, he said, referring to a memorandum, the city was authorized to build the Hetch Hetchy water and power development on federally owned land, with the provision that the power must be distributed through public facilities.

"He said the Supreme Court had held that the city could not use private distribution facilities, although the matter was in process of re-litigation.

" 'But,' the President said, 'there has been some political effort made to make the people of San Francisco believe that Congress will change the Raker Act.'

"He said he doubted very much that prudent Congress and prudent administration would be willing to relieve the city of the original obligations under which the whole Hetch Hetchy program was started."

OCTOBER 16, 1941—Abe Fortas, acting director of the Interior Department's Division of Power, attacks PG and E policies in a speech before National Reclamation Association in Phoenix, Ariz.

(He came to San Francisco from Phoenix and took part in the closing days of the campaign for the bonds.)

OCTOBER 24, 1941—Governor Olson, in a broadcast speech, tells San Francisco voters: "You *must* pass these bonds."

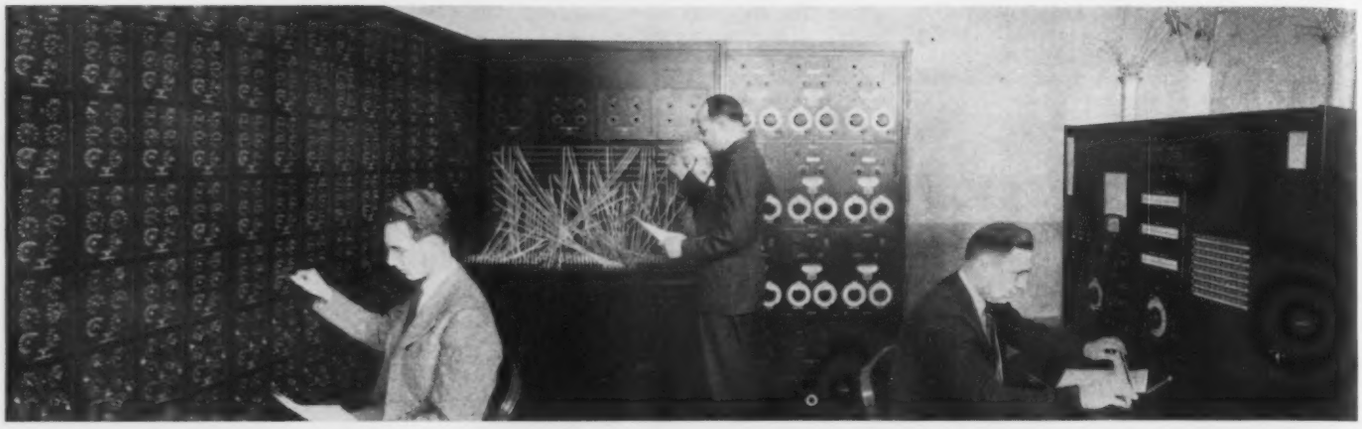
He refers to PG and E as a "lawless corporation."

OCTOBER 28, 1941—Secretary Ickes, in San Francisco, states at a press conference that he does not know when Shasta power will become available, and bitterly attacks PG and E.

He says Olson has conferred with the Department on establishment of a Joint Authority for handling Shasta power and Central Valley water, believes "we can get together."

OCTOBER 29, 1941—At a major civic rally for the bonds, with Ickes as the principal speaker, Governor Olson makes this statement: "I want to see the Pacific Gas and Electric Co. taken over for all of the northern part of California. We are never going to get the benefits of government ownership of water and power until they are put out. I do not propose to stop in this movement for development and distribution of government power in the northern part of the state. We have been through the fight in southern California, and it is almost all under public ownership there. Now we must finish the fight against the Pacific Gas and Electric Co. in the north. It is so clearly a people's proposition (the bond issue) that any official who does not support it violates his trust as a public servant. I want the resignation of any appointee of mine who says he is not 100 per cent for the bonds."

NOVEMBER 4, 1941—San Francisco voters defeat the $66,500,000 power bond issue. Yes, 67,214; No, 114,879.



Costing $85,000 this a-c analyzer has been installed in Bonneville's system planning department. At the left is the circuit unit cabinet; in the center is the circuit connection cabinet and generator panel; right, the operator's desk

Network Analyzer Solves System Problems

Bonneville Power Administration installs first a-c network analyzer West of Mississippi to save time and money in working out many problems relating to transmission line construction and operation

By Glenn W. Bills

System Engineering Staff, Bonneville Power Administration

TO FACILITATE construction of what may well become one of the world's largest power systems, the Bonneville Power Administration has installed the ninth a-c network analyzer to be constructed in the U. S. and the first to be located west of the Mississippi. The new instrument is being used by the power administration's system engineering section in the solution of system problems related to the needs of the rapidly growing transmission network. Constructed and installed at a cost of approximately $85,000 the analyzer has already proved of extreme value as a time and money saver.

Prior to invention of the analyzer in 1929, system engineers attempted to solve power system problems by duplicating the actual systems with small three-phase generators, motors, static loads and artificial transmission lines. However, it was soon found that rotating equipment in general took too much space, was too costly, and in cases involving more than three or four machines became impossible to control. These limitations led to the development of a static type of miniature system which could be used to obtain on a laboratory scale the solution of problems involving extensive power systems. Even problems involving transient conditions lasting but one-half second are possible to solve quickly and effectively by applying to the board an analytical step-by-step solution which gives a "slow motion" effect of the sequence of events which occur during an abnormal operating condition. (Such slow motion effect can be made as slow as desired by choosing a small time interval in the solutions for certain machine constants.) Similar results can sometimes be obtained by long-hand methods, but the solutions, given almost instantaneously for each step by the calculating board, may involve so many variables that an enormous number of man hours may be consumed, and the chances for error are enormous.

The present type of alternating-current network analyzers has been developed by the Massachusetts Institute of Technology, General Electric Co. and Westinghouse Electric & Manufacturing Co. The first such board was built in 1929 in the electrical research laboratory of M.I.T. at Boston, with the Institute and G-E cooperating in its design and construction. This analyzer is still in active use. Since then, seven other large boards have been built.

General features and design details of the power administration's analyzer were specified by the Bonneville system engineers. Basically, it is similar to the analyzer in use at Schenectady. Design of the Bonneville board also provides for a maximum of versatility and allows for such additions as operating experience may indicate are required.

The Bonneville analyzer comprises three cabinets together with a combination instrument and control cabinet and operator's desk. One of the cabinets contains generator units which supply power to the miniature net-work being investigated. This power is derived from a remotely located motor-generator set controlled from the analyzer.

The 5-hp. motor-generator set supplies 480-cycle, three-phase power at 440 volts through an autotransformer to the nine analyzer generator units. An exciter and a phase-balancer are directly coupled to the motor-generator. Although the nine analyzer generator units have single-phase load characteristics, substantially balanced voltages are maintained at the terminals of the three-phase generator by means of the phase balancer. Power supply is a three-phase, 208-volt, 60-cycle circuit of the power administration's North Vancouver substation, where the analyzer is set up.

The use of a 480-cycle frequency together with very small analyzer network voltages and currents makes it possible to use small and compact circuit units. This results in appreciable savings, both in cost and space, and power consumption is minimized.

The analyzer's nine generator units

are mounted in a single cabinet and each unit may be so adjusted that its single phase output voltage may be varied in magnitude and time relation ship with that of each of the other generator units, the adjustment being made independently of each other. Although these units are termed generators and represent the generators of a power system, they are actually static phase-shifting transformers. Thus, the difficulty of trying to control nine rotating elements simultaneously is eliminated.

The generator panel is adjacent to a circuit-connection or plug and jack cabinet where all circuit connections are made and in which the connections to all generators and circuit elements terminate. At right angles to this cabinet is the circuit unit cabinet.

The circuit units are used to represent the various constants of the power networks. There are six types of such units as follows:

(a) Fifty line-impedance units numbered 1, 3, 5, etc., up to and including 99. These are used to represent transmission lines and other less important circuits of small impedance and consist of variable resistors and reactors connected in series.

(b) Thirty load-impedance units numbered 201, 203, etc. up to and including 259. These are used to represent static loads such as the Alcoa load at Vancouver. They consist of variable resistors and reactors connected either in series or parallel and have much higher impedance values than the line units.

(c) Nine synchronous-impedance units. These are used to represent the synchronous impedance of machines when making system fault studies. They are similar to line-impedance units except that they are designed with an extremely low copper and iron loss in the reactors so as to secure a power factor of approximately one per cent or less. They are numbered from 601, 603, etc., up to and including 617.

(d) Thirty capacitor units. These are used to represent the capacitance of the line, and frequently to represent synchronous condensers as well as negative reactance which may occur in equivalent transformer circuits. They are numbered 301, 303, etc., up to and including 359.

(e) Six autotransformer units. These are numbered 501, 503, etc., up to and including 511 and are used to step up or down the voltage at points in the network where there are transformer taps or where there are autotransformers.

(f) Five mutual-transformer units. Magnetic couplings between parallel transmission lines may be simulated by use of these 1.1 ratio transformers whose degree of mutual coupling may be varied by use of an adjustable impedance unit connected across the secondary terminals. These units are numbered 401, 403, etc., up to and including 411.

Each unit is connected by wiring to plugging cords in the plug and jack cabinet. These cords are colored and numbered in such a manner that identification of the currents and voltages corresponding to each unit is easily made when readings are taken on the analyzer meters. To make connections, the plugging cords are inserted into jacks located in fourteen horizontal rows on the vertical jack panel. By inserting plugs into adjacent jacks, the plugs are connected to a common junction point. By skipping at least one jack between plugs an insulating gap is formed and there is no connection established between such plugs.

All jacks in the bottom row are shorted together to form a common junction or ground as the case may require. This bus can be connected to ground by turning a small key. Each generator unit has a pair of jack outlets located on the jack panel into which circuit unit cords may be plugged. A turn key switch for each generator makes it possible to connect or disconnect one generator terminal to or from ground.

In addition to these methods of connecting units, there are 19 pairs of jumper cords and plugs used to connect any two points on a network by means of a connection having negligible resistance. There is also a plugging cord which may be used to place a

Fig. 1—One line system diagram as of Sept., 1941

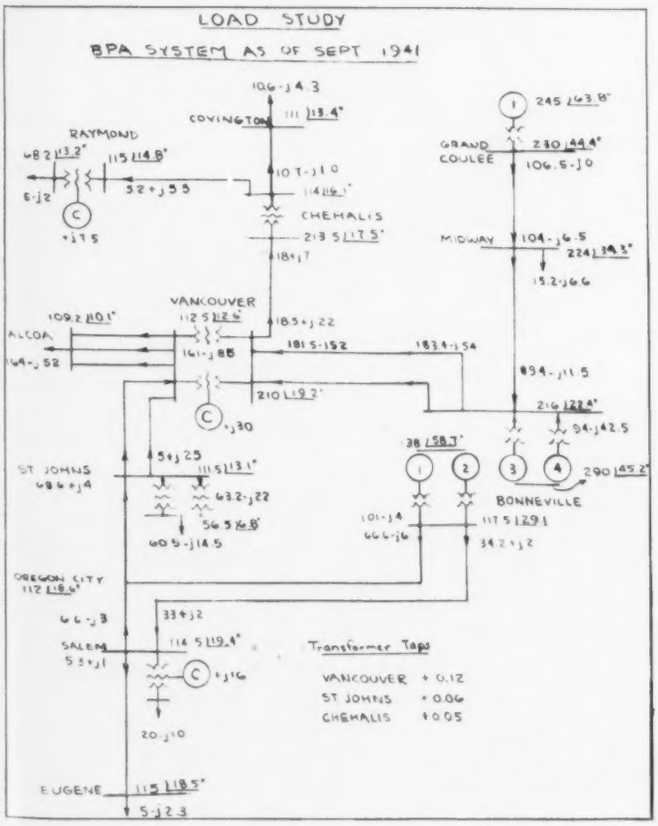
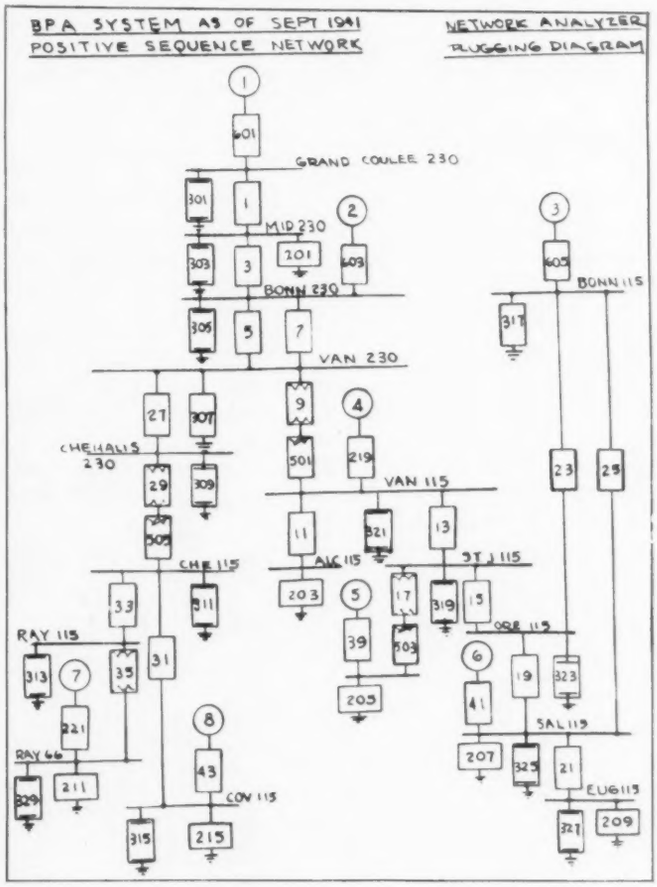


Fig. 2—Plugging diagram based on data in Fig. 1



fault to ground at any point in the network by inserting it in a jack adjacent to the junction point which is to be faulted. Another special plugging cord may be used to measure the differences in voltage between any two points in a network.

There are three master instruments, a voltmeter, an ammeter, and a watt-meter-varmeter, which are located on the instrument and control panel of the operator's desk. Each of these meters produces a light beam with a narrow vertical black line in its center which serves as a pointer. These beams shine on opalescent instrument scales. All meters indicate simultaneously, and various ranges are provided for by means of an auxiliary switch located below the scales. Each meter may be connected indirectly at the desired point in the network through vacuum tube amplifiers. In measuring the magnitudes of voltage, current, watts, or vars, the energy taken by the meters is comparable to the energy used in the network. Consequently, these meters would seriously affect the network values if they were to be connected directly into the network. It is for this reason that voltage and current amplifiers are inserted between the meters and the point in the network to be measured.

Through the use of switches, push buttons and relays it is possible to connect the amplifiers to any unit of the network in such a manner as to be able to measure with the meters the voltage across any unit or the difference of potential of either side of this unit from any other point in the network. It is also possible to thus measure the current, power and vars going into, through, or coming out of any unit of the network.

In addition, by means of a master static phase-shifting transformer on the instrument panel, it is possible to measure the phase relationship of the voltage or current of any circuit unit with respect to a common reference or with respect to that of any other unit, and by the same means the vector components of these voltages and currents may be read directly on the meters.

The master instruments have an overall accuracy of within plus or minus one-half per cent of full scale for all but very low power factors. This gives greater accuracy than is needed in view of the fact that the network constants of a power system are not known within that degree of accuracy.

Following installation at Bonneville's research offices, the analyzer was first used for a series of load studies. One such study, typical of its kind, was that made of the Bonneville system as of September, 1941.

First, it was necessary to determine as nearly as possible just what the system would be like in 1941. This involved a study of future loads and a knowledge of the lines and equipment which would be in operation at that time. With this in mind, a one-line diagram similar to that shown in Fig. 1 was drawn and the desired terminal conditions such as voltage, current, phase angle and power at each of the various substation buses were denoted.

From the preliminary one-line diagram, a diagram known as a plugging diagram — Fig. 2 — was made. This showed just what network analyzer units were to represent the component parts of the power system. For example, the generator at Grand Coulee was represented by generator unit 1, its internal impedance plus the transformer impedance by synchronous-impedance unit 601, the Coulee-Midway transmission line by line-impedance unit 1, half of the Coulee-Midway line capacitance to ground by capacitor unit 301, and so on.

Such simplifications as those of combining parallel transmission lines and representing them by one line-impedance unit or representing the four generators at Bonneville by means of only two generator units or combining line reactances and transformer reactances were also made, as such simplifications reduce the work on the analyzer and do not affect the accuracy of the representation.

After the plugging diagram was completed it became necessary to assign the correct settings for each circuit unit. From the data which had been previously assembled on the system and reduced to a 100,000-kva. base (this reduces the actual values of the system constants to such magnitudes that they can be represented by the circuit units of the network analyzer) the correct setting for each unit was calculated and tabulated. It might be well to mention here that per unit values were used in setting the circuit units, as their dial markings are calibrated in per unit values. For example, if a 230-kv transmission line had a total reactance of 32.7 ohms, to represent this on the board by means of a line-impedance unit a conversion would have to be made and could be done in the following manner:

$$\text{Board Setting} = \frac{\text{Base Volt-Amperes} \times \text{Reactance}}{(\text{Voltage})^2}$$

$$= \frac{(100{,}000{,}000)\ (32.7)}{(200{,}000)^2} = 0.062$$

The dial of the line-impedance unit when set at 0.062 would represent the transmission line in the miniature system of the calculating board.

The next step consisted of connecting the units on the calculating board as indicated by the plugging diagram. This operation was done on the plug and jack panel. After setting the circuit units correctly, the network analyzer is ready for operation.

The analyzer was energized and a "cut and try" method of adjustment was begun. This meant that each generator unit and various load-impedance units had to be adjusted until the desired terminal conditions were gradually attained. The voltages, currents, and power (real and reactive) for the important buses had to be checked constantly as the system was adjusted. Changing one generator, of course, affected the entire network so that adjustments of all generators had to be made after each change, until by trial and error, the desired conditions resulted. When these were deemed satisfactory, complete readings of the voltage, circuit and power distribution were taken, and the analyzer's function was completed.

The results of this study are shown on Fig. 1, on which are shown the voltages of the network in kilovolts, as well as the watts and reactive volt-amperes in megawatts and megavars.

This load study was the beginning of a series of circuit studies. The same plugging diagram, with perhaps a few modifications, was used for the short-circuit calculations and the steady state and transient stability analysis.

It is apparent that the network analyzer may be used to help solve a great number of different problems. Of these miscellaneous problems, the most outstanding appear as the analysis of: (1) transient and steady-state stability; (2) short-circuit conditions; (3) power flow and power dispatching; (4) voltage control at load centers; (5) relay settings and oil circuit-breaker duties; (6) determination of rotating equipment to be installed in future developments; (7) reactive power requirements; and (8) voltage regulation.

The analyzer has been in constant use since it was first installed and tested. Usually there is always one large system represented on it, and in addition, one or two smaller problems are often being solved at the same time. The Bonneville board is sufficiently versatile not only to solve all types of electrical problems, but, if need be, to solve certain hydraulic problems and perhaps some mechanical problems which have electrical analogies.

Snowmobile

High country winter line work safer, faster for Edison crew

WITH snow packing in deep drifts, many an electric utility is now face to face with the task of servicing lines which traverse high, rugged country, and which are virtually snowbound. Southern California Edison Co. has made this task much easier. When snow covers the high mountains, Southern California Edison wheels out the snow tractor which underwent succesful shakedown cruises and actual-service runs during the last winter.

The phrase "wheel out" is not strictly accurate, for the unit comprises a tractor, operating on a single track which extends across the full width of the machine, and a sled, which is towed behind. The tractor looks much like the British tanks of the World War.

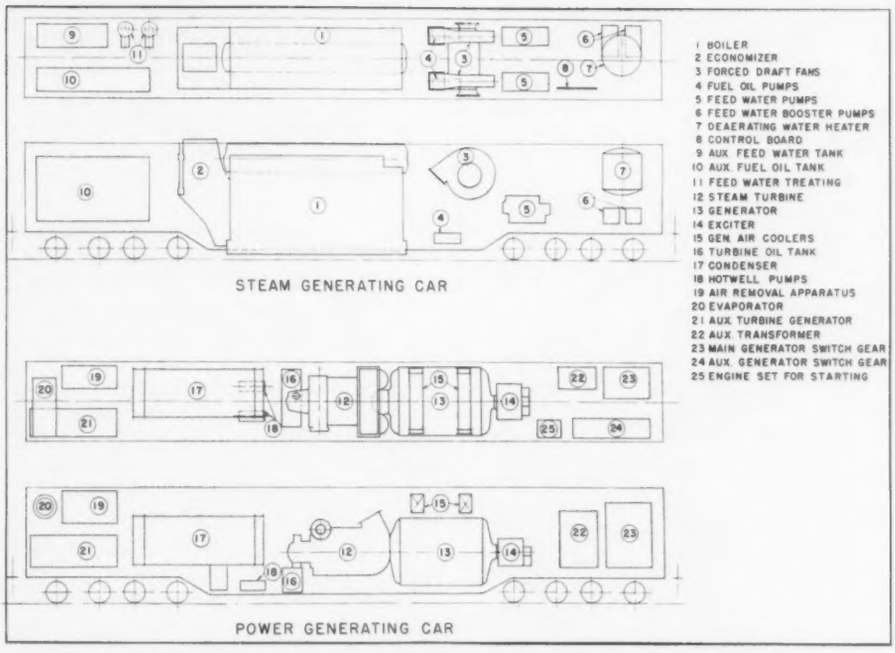
Powered by a 95-hp. motor, it is built to negotiate a 55% grade. It will haul a 2½-ton load, at speeds varying from one-half mile per hr. in low gear to 20 miles per hr. in high gear going down hill.

Steering is accomplished by using the sled as a rudder. The tractor, having only a single track, is not capable of steering itself. So the tow-bar assembly on the sled (made of steel tubes in a V shape) is fastened to the tractor with a ball and socket joint, and a winch-and-cable system is used to alter the angle between the tractor and sled. There is a winch on each side, and the cable on one side is taken up as that on the other side is let out, much in the same way that a ship's rudder is often operated. So that the sled will exert its proper effect as a rudder, it is equipped with two vanes, one on each side, each consisting of a steel plate 4 ft. long which extends down into the snow about 6 in.

The type of cleat used on the tractor can be seen in the photograph. Not evident, is the fact that the weight of the tractor is carried not on the crawler, but on a bottom plate. The crawler is for traction only. Weight on the bottom plate approximates 170 lb. per sq.ft., about that of a man on snow shoes.

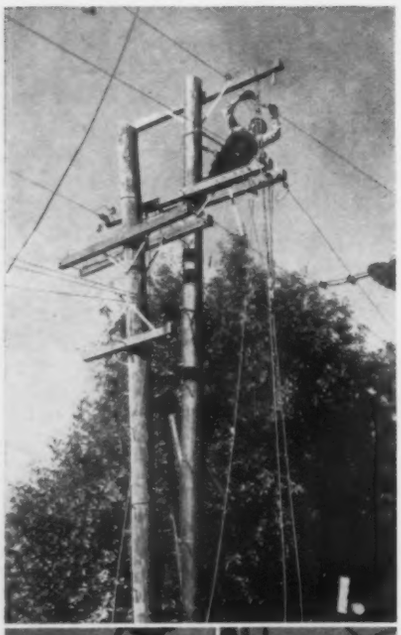
The machine was designed and built first for use by the U. S. Forest Service on Mt. Hood, Ore.

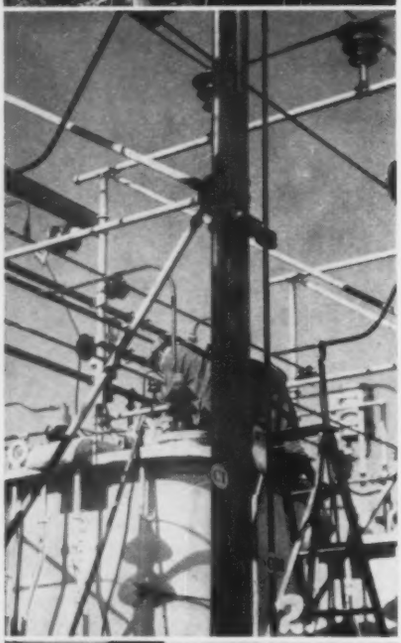
Edison has found the tractor of great value in transporting men and materials and in provisioning snowbound outposts, as well as in repair and snow-survey work in general. P. H. Ducker, superintendent of transportation, emphasizes its value in providing safe, dependable transportation, as against the hazards of illness or accident incident to travel by snow shoes or skis.



Emergency power requirements of naval shore establishments along the Pacific Coast will be met by a 10,000-kw. mobile steam-electric plant mounted on special railway cars. General Electric is building two such units, one for the West and the other for the East coast. A mobile substation will be used in conjunction with the plants. Capable of traveling 40 miles per hour, the plants can be put on the line within 24 hours. Fuel oil will be burned under the boilers. Boiler rating will be 140,000 lb. of steam per hour. The single cylinder turbines will be designed for 550-lb. steam at 825° F. The 3,600-rpm. generators operate at 13,800 volts.

Three views of single-track snow tractor operated by Southern California Edison Company in back country where lines traverse high, "snow shoe" territory





Safety Shows Feature Quiz Contest—Win Wide Attention

PG and E safety film, divisional quiz contests win all-family interest and support for safety rulings

EDUCATIONAL programs to promote continuous and improved observance of "safety first" principles are the important responsibility of the safety engineer—and when offered in novel, yet constructive, fashion pay real dividends in accident prevention and property damage reduction. Most popular safety educational activity yet developed by the Pacific Gas and Electric Co. has been a "quiz program" patterned after similiar radio shows. Its latest adaptation features a slide series of "what's wrong with this" pictures shown at the annual safety meetings held in each of PG and E's fifteen divisions. The success and popularity of these contest programs indicates that here is a stimulating method of selling accident prevention to company employees.

PG and E educational programs are under the direction of a central safety committee functioning on this basic policy: Active interest and support of management; and acceptance by the supervisory force of its responsibility for safety by (a) proper selection and placement of men; (b) training in job technique and safe working procedures; (c) planning and organizing work to insure orderly job performance; (d) safe maintenance of physical properties; (e) provision of suitable protective equipment and complete instructions as to when and how to use it; and (f) close supervision and follow-up to insure that instructions are understood and properly carried out. The central safety committee personnel consists of operating heads of various departments. It coordinates all accident prevention work of the company.

Shown at left and on the opposite page are representative views taken from the slides shown contestants of the PG and E safety show and division "quiz" contests. In each of these pictures, there are several or more infractions of safety rules as developed in the PG and E Code Book of safe practice. Projected on slides large enough for the entire audience to see, the contestants in each division were required to name all errors observed and their three-man team was rated on the total errors properly called off. These pictures, to add interest, were taken of regular PG and E crews on various jobs throughout the company's territory. They were posed to illustrate common mistakes in various regular operations. Before reading the answers here check your own safety knowledge on these nine representative pictures shown on this and the following page

For many years the company has provided each of the company's fifteen divisions with an "annual division safety meeting" program—trying each time to offer variety and originality on the basic theme because the meetings are attended by employees and their families and held in the evening. It was found that selling an employee's family on safety was even more resultful than mere repetition to the workers on the job or in employee-only meetings. To keep away from dry, speech-filled meetings the program was formerly built around such things as actual demonstrations of various types of tools and their uses, together with colored motion pictures that enlarged upon the demonstrations.

In 1940 the "quiz" program was evolved based on the company's safety rule book. Prior to the division meeting proper, efforts were made to encourage study and review of the safety rules and regulations—and this was followed by elimination contests in each division to select two teams or crews to take part in the annual division meeting. These teams consisted of three men each and prizes were awarded to the winners.

Effectiveness of this "quiz" production was so apparent that the central committee agreed a return engagement was in order in view of the benefits to be derived. For the 1941 contest a series of "hay-wire" pictures were posed in the field. These were staged by men in the field in the various departments and showed job operations being performed contrary to safety rules or contrary to common safety practice. The pictures were taken on 28x44 mm. Kodachrome film which was

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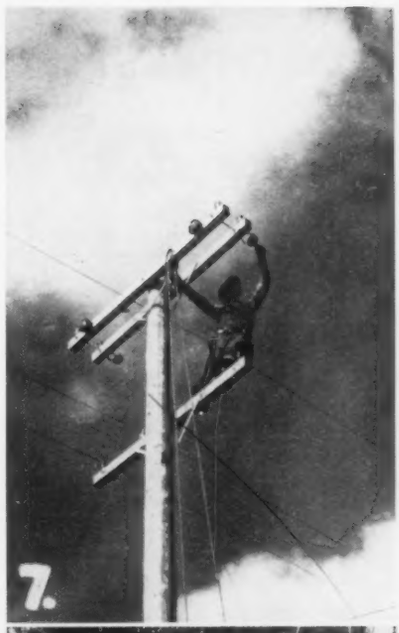
mounted for use as lantern slides.

At the meetings, the slides were shown on a large screen for the whole audience; microphones and loud speakers were used for the "quiz professor" and the contestants. The contestants were required to remark on all safety violations or rule infractions in each shot. Each of the three contestants on each of the three teams reviewed two different pictures and was given a grade based on accuracy in citing all infractions. Audience interest was excellent and the element of a contest counted strongly in this at each local gathering.

To avoid leaving a negative impression, however, a second part was devised for the program—consisting of a 2,000-ft. Kodachrome talking picture showing the right way of doing the various jobs shown in the "haywire" pictures. Also stimulating interest in the program as a whole was a scenario contest conducted among all employees and a story prepared from the winning submission. The film, shot by a commercial organization, ran approximately 4,000 ft. and was edited to the 2,000 ft. showing length, with the narrative synchronized to the action.

1. On this transfer from an old pole to a new pole everything on the pole is hot or is to be treated as such. No rubber gloves, no rubber protection and the pole is improperly supported.
2. In this maintenance job on a 60-kv. transformer bank the grounding clamp is off the high tension terminal.
3. In work on this 440-volt controller box the serviceman should wear rubber gloves and be insulated from the ground.
4. Man digging pole hole has spoon too close to foot. Blade should not be turned up and man should wear gloves.
5. Coverage on the primary leg between the two men engaged in splicing through the primary is inadequate.
6. Metallic rules or tapes should not be used around electrical apparatus as in the case of this open 11-kv. switch compartment.
7. Safety belt is not around the pole.
8. Generally bad housekeeping. With two men working on the pole groundman should not be underneath any more than necessary. Child and dog are periled. Guy guard should be kept from sidewalk and ladder away from steps of house.
9. Changing fuses on telephone structure parallel to high voltage (telephone circuit should have same treatment as high voltage) workman pulls fuse with bare hands, leaves rubber gloves on ladder and fails to set ladder on insulated stool. He also failed to open knife switches.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NORTHWEST ELECTRIC LIGHT & POWER ASSOCIATION

Utilization Data Sheet No. 44

SUBJECT.....PAINT DRYING
CUSTOMER.....GRAY'S AUTO SHOP
TYPE OF BUSINESS.....AUTO BODY REPAIRING
SIZE OF BUSINESS.....EIGHTEEN EMPLOYEES

Prepared by L. E. Stairet for the Industrial Section

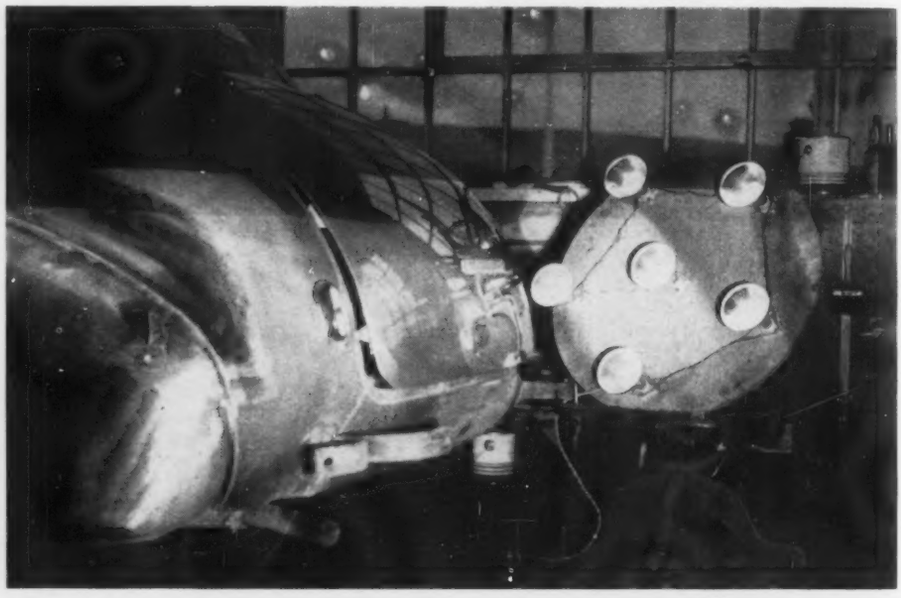
Gray's Auto Shop, Lewiston, Idaho, auto body repair concern, formerly used simple air drying on their paint jobs, which crowded the shop with small paint jobs, took a long time to effect a thorough drying. Switching to reflector drying lamps, arranged in circular fashion on a portable rig, the drying time was cut to one-fifth of the original time and improved the quality of the finished job.

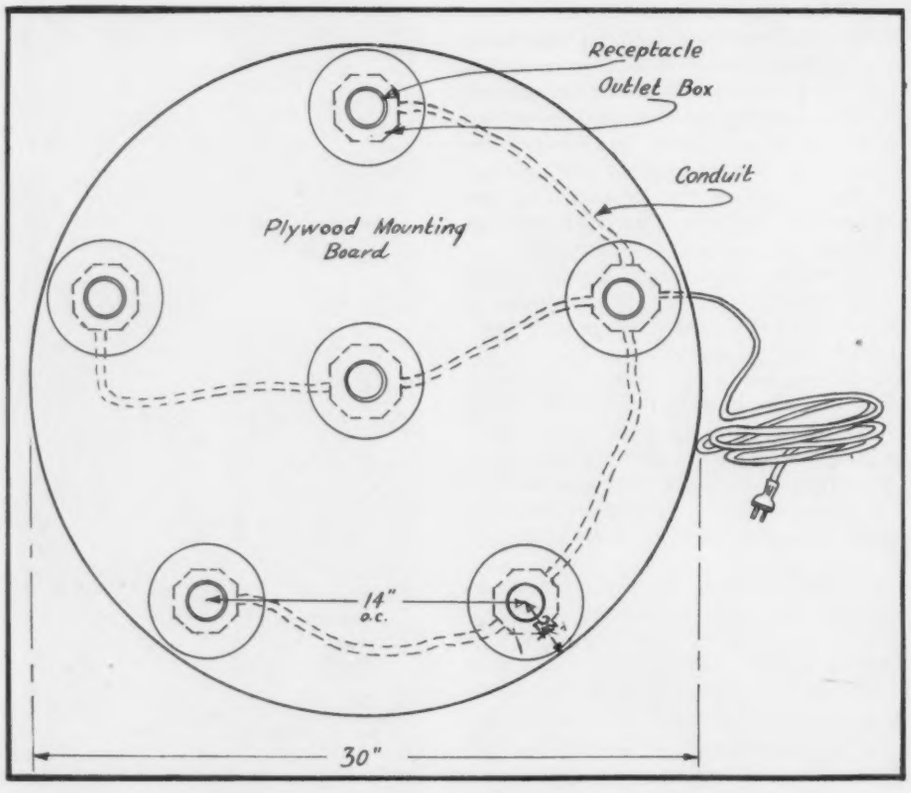
Advantages

Coupled with the saving in time and labor, the equally important savings in shop space which is always at a premium, is the fact that electric lamps offer a drying service free from any possible fire hazard. Quick, even drying is accomplished by the special mounting described and illustrated in the detail drawing and photograph of the equipment in actual use.

Customer's Conclusions

Mr. Gray comments: "In the past I found my paint shop crowded on account of the slow drying of small jobs. I find now, by using paint drying lamps, that I can turn out these small jobs in one-fifth of the time, resulting in improved paint jobs and less loss of time in drying process. I plan on increasing the use of drying lamps in my auto painting business. By mounting the lamps in a circle, rather than in a line, we found a better coverage of heat could be applied to small surfaces."





Equipment Replaced Air Drying Equipment Installed

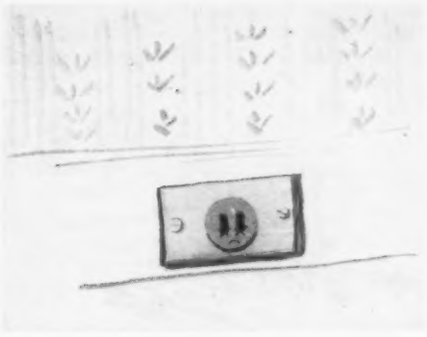
Now employed are five R-40, 250-watt reflector drying lamps arranged on portable stand as shown in the accompanying photograph and sketch.

Installation Data

5 cleat receptacles	$ .75
40 ft. No. 16 heater cord	1.60
25 sq. ft. plywood	2.00
5 R-40, 250-watt infra-red mazda lamps	12.50
Labor	2.00
Total	$18.85

Slumbering Sockets

Ex-insider says "wake up and sell" to industry's shortcomings; points to specific opportunities



SLUMBERING sockets is a term I've coined because it says the following in two words: The load factor on an ordinary circuit in an ordinary house ain't what it ought to be.

Slumbering sockets will probably be admitted as a fact by many electrical men. So I won't dwell on them at length. But it seems to me that electrical men are prone to let them go on sleeping, whereas it would be easy to wake them up. This I shall explain.

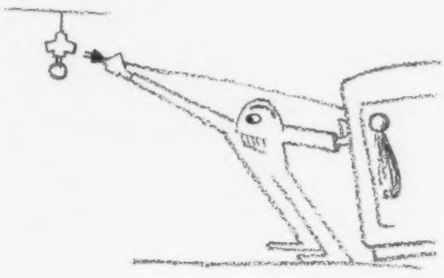
Because I may speak with familiarity of kilowatts now and then, some of you may suspect that I am an insider, and not just a plain old customer who doesn't know his meter from a bucket. Well I was, with no apology, connected with the electrical business for a time. But since the army got me early this year, I have been and remain a house renter and electrical user of no small proportions.

My wife and I have lived in five or six places since the checks started coming from Uncle Sam, all of them regular civilian residences "off post." In each, we have had to carry on a lone, one-couple battle, getting electricity out of so-called convenience outlets and into use.

All along the line our use of electricity has been held back by a dirth of plugs and cords and multiple outlets, and there's never been a soul except ourselves to care. Right now, I have to unplug a lamp in order to plug in the phonograph—a situation which I hope to rectify some day. But it will involve a 30-mi. roundtrip, some time shopping in Woolworth, Sears-Roebuck, and Kress, and some more time skining and cutting wire, screwing screws, etc., all without quite adequate tools.

Let any electrical man who winces at the way I conquer my distribution problem look to his own clientele and see if he is helping them surmount the mundane obstacles which I shall now describe.

There was the refrigerator, our first. It arrived in all its pristine glory and was set down in the kitchen in a place which had been carefully selected in advance. There was just one difficulty:



The refrigerator had a short cord.

By moving it into the center of the kitchen, we were able to connect it to a socket overhead. The drawbacks of this solution are apparent. The electric range carries a convenience outlet, but there are other obvious drawbacks in situating the refrigerator immediately in front of the range. So a lamp was taken out of service in the living room and moved to the kitchen, where it functioned for a time as an extension cord. Needless to say, its electrical consumption during this period was limited to copper loss.

Eventually, the 30-mi. trip and other procedures (described three paragraphs above) were accomplished, and the lamp was returned to lighting the living room again.

I daresay that any good electrical man will observe that this house I'm living in isn't adequately wired. I daresay too, that that fact became painfully evident to me long ago.

Sometime this house will be adequately wired if I'm still living in it, but it will be a good long time. I haven't got the money to do it, even if I wanted to put copper into somebody else's house. And the landlord isn't going to do it because my own self preservation depends upon my hitting him for a new roof first. In the meantime we shall struggle on alone, trying to get our appliances into use with what outlets and spare time we have.

What I wondered just the other night, as I stripped a little skin off my finger, along with the insulation from a wire I was fitting to a plug—what I wondered was "How about the fellow who can't strip a wire, or who isn't imaginative enough to see the convenience he'd get out of a few extra feet of cord?"

And that made me wonder just how many lamps and appliances are sitting idle because it's just too much trouble to keep shifting them around so they can be turned on. Or how much electricity could be put to work by giving a little attention to how a particular customer would like to use it, and how he could use it that way without spending much money.

For instance, I built a little cabinet on wheels which holds our electrical appliances. I drew the design, spacing the shelves according to the appliances they were to hold. I took the design to a cabinet maker who delivered the cabinet unfinished for $5.50. I painted it myself. It is equipped with roller-bearing casters so that it can be pushed into any room of the house. On one side, at top level, it has a multiple outlet. This is fed by an extension cord which emerges through the back of the cabinet, and which is wound with one of those wire curly-cues so that it coils itself up when not in use.

This little cabinet has increased our use of all our appliances at least 100 percent. Now the oranges are always squeezed electrically, whereas it used to be just too much trouble to get out all that gear. We push it to the breakfast table and can make coffee and toast or waffles at the same time without getting the flat silver tangled in a mass of cords. And in this inconveniently-outletted house I'm living in, it's awakened a lot of slumbering sockets.

Now the fellow next door may not like to design cabinets. And it might not occur to him that if he had a 10-ft.

extension cord for that heater he'd use it twice as much. Why doesn't a utility man drop in and help him out?

Right here I want to remark that each place we've moved, a little ceremony has been enacted. The telephone company has sent around two pug-uglies to put in our 'phone. Despite appearances, they have borne authority and manner of Harvard men. They have done the most gentlemanly jobs of installing that I have even seen. They have left us quietly, with helpful hints, a little store of wisdom, and the feeling that that black thing is a miracle indeed.

But in each case the power has come on as mysteriously as electricity itself.

The result is that we pay an immense telephone bill almost with warmth. But if it wasn't that I was once an electrical man, I'd look askance at my power bill, small as it is for what I get.

In other words I think—in fact I know—that the utility would gain something simply by having a representative on hand.

Lest he wonder what he might do when he got here, here is a list of amateur improvements which he might have made easier (and better) in my house, had he been around a month ago:

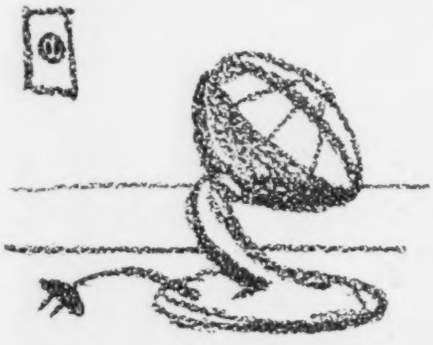
1. The refrigerator connection (mentioned above).
2. Another multiple outlet in the kitchen, for convenience at the breakfast table (and in addition to the one on the cabinet, also mentioned above).
3. An arrangement in the bedroom, whereby I take power from an unused wall fixture and get it unobtrusively over to the bedside stand, where it lights the lamp and runs a radio and clock.
4. An assortment of extension cords for the living room.

If he walked in tomorrow morning I'd be a sucker for a couple of bulbs of higher wattage, and I'd start in using my electric heater if he'd figure out a way for me to plug it in conveniently without rewiring the whole house.

I urge no let-up in any adequate wiring campaign. A home dweller is well aware of inadequacy when he can't find a place to plug in his lamp. And don't tell him he may trip over a lamp cord if you walk in the house and find him sprawled on the living room rug. He'll be thinking about adequate wiring some bright day of his own accord.

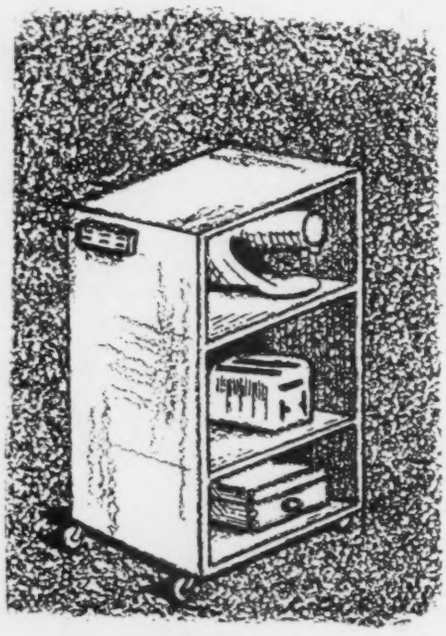
But is there any reason why that eventuality should work against loading up the copper that's already in the house? I'd lay a bet that for every immediate prospect for adequate wiring, there are ten immediate prospects for socket awakening. And I can state on the authority of personal observation that they are being completely overlooked. I just venture the opinion that too much selling is being concocted on too fancy a scale. It's a little too idealistic and a little too far removed from the personal, individual desires of a vast assortment of customers, no two of whom are alike.

I'd like to have a man walk in my house tomorrow and tell me where to buy good plugs and outlets and extension cords. I'd like to know how much



I can load up my existing wire, and how to keep it protected at the fuse. I want to know the name of a good, reliable local electrician who will come in now and then and do a small job, without tearing the house apart or charging me too much.

In other words, like a lot of other customers, I want some help in waking up these slumbering sockets and getting my electricity to work.



RMEL Promotion Change

Pre-Christmas appliance show is replaced by seasonal advertising

Belief that manufacturers would not be able to supply the demand for electrical equipment promoted by the annual pre-Christmas Rocky Mountain Electrical League's exposition in Denver, Colo., decided RMEL to let their mid-winter promotion take the form of a "convention in print" with newspapers, broadsides and pamphlets advocating electrical appliances as Christmas gifts. It is thought this promotion will suffice to hold the seasonal market for electrical goods.

Simultaneous with the above announcement came news that the Casper, Wyoming, chapter of RMEL, will hold its annual electrical exposition December 4-5 and 6; that Sterling, Colo., chapter, newest League affiliate, will initiate its promotional work by a pre-Christmas exposition, November 26 and 27. Both units will use the famous "black light" equipment and other showmanship which has contributed to the success of Denver expositions.

The Denver chapter, operating under leadership of T. M. Foulk, chairman of the Christmas Lighting committee of RMEL, will work towards outdoor Yule illumination of a spectacular nature. Tubular neon lighting will replace incandescent lamps in Denver's downtown area providing a novelty of design aimed to encourage private installations in residential districts. Plan books are being rushed to League units in Colorado, Wyoming, New Mexico, Montana, South Dakota and Western Nebraska. National defense and patriotism will be the theme, with electrically illuminated army planes playing a part.

League achievements in 1941 were commemorated Nov. 17 at Denver when new members were initiated at a luncheon-meeting presided over by Gaylord B. Buck, president. The new roster discloses that every major electrical outlet in Denver except one is now a member of RMEL. This showing is attributed to the exertion of Membership Chairman Herb Names and his fellow workers who staged a campaign under the slogan: "No more free riders."

● TERMS ON APPLIANCE sales may be shortened still more, according to Washington observers at McGraw-Hill news office; 18-month terms may be cut to 16 and 14 or 12. The Federal Reserve Board is studying the situation. Especially will restrictions be made on loan companies to require of them more data on purpose of loans.

Light Sales Plan Really Original

Washington Water Power sales force gets new approach, new technique on lighting

PROSPECTS of a shortage of durable goods, especially in major electric appliances, throughout the industry has forced the Washington Water Power company's sales department to develop a new technique in its approach to the time-worn service of residential lighting. What the diagnostician is to the sick room, what a landscape gardener is to home owners, so the salesman now becomes a lighting specialist who is qualified both to diagnose numerous troubles found in lamps or lighting, room arrangement, color harmony, and to prescribe effectively remedies in language more understandable to the customer than Latin.

The plan, tailored to each room in each customer's home, calls for a somewhat broader training than the average utility salesman is accustomed to. But the salesman does not object to that. When a hazard threatens his job, he will work at sales innovations with a will.

"All-out Aid To Better Seeing," is the name of the new program, which started its initial trial October 1, to extend for three to five months. During that time the salesmen will make five lighting calls per day, reaching the company's total 72,000 metered customers. Dealers are enthusiastic, because it will send customers into their stores with materials carefully prescribed in hand. Manufacturers are pleased, because much of the materials used in the campaign have little to do with priorities. And salesmen, according to R. B. McElroy, general sales manager, have been aroused from past weeks of gloomy uncertainty and are "rarin' to go."

Preparatory to the start of the program, sales people were called in for a comprehensive lighting conference. Effects of the defense program on selling were explained, and the employee-company need for such a program.

Lighting standards in each room of the modern home were defined by experts. Skits emphasized pitfalls that yawned for the uninformed. Films on lighting were shown; the group adjourned to an old-fashioned kitchen, bedroom, living room, dining room and bath, where glare, shadow, improper placement and inadequate light were streamlined to accepted comfort and beauty standards by specialists. Then, just as water leaving the millpond churns the paddle wheel, so the conference turned into an active clinic. Teams were chosen, and these groups were given photographs of unlighted homes to contest for the best presentation that was possible.

Realizing that home improvement includes more than lighting arrangements, the company brought interior decorators into the conference to teach the salesmen fundamentals of color harmony, things to watch in recommending wall paper, carpeting and the arrangement of furniture, draperies, etc. When the conference ended, salesmen were fairly well qualified to knock on Mrs. Customer's door, saying:

Play-backs aid home service advisors to tell organized sales story

"I am your local representative of the power company. With defense uncertainties forcing everyone to turn attention to the security of home, I called today to give you a few suggestions on lighting arrangement. A woman, you know, can be as proud of her living room or kitchen as she is of her personal appearance."

Important to the lighting adviser as a sales tool is the prescription booklet designed to be left in the customer's home. This booklet is a personalized recommendation for each room of the home. The outside corner carries the hand-inscribed name of the customer. The next page briefly tells what light will do by way of beauty, eyesight protection and health; the third page tells what good light is, showing all types of lamps, lighting fixtures and adapters for light conditioning. Under all material illustrations are key letters and catalogue data. Follows pages devoted to various rooms, crosshatched space for sketching in room arrangement and lamp recommendations. The pages also show lamps and fixture types peculiar to the room, space to show the additional wattage created by additional lamps, approximate hours used per month and the kilowatt hour cost. They also allow the salesperson to list materials, key numerals to correspond with arrangement suggestions and approximate cost. The booklet ends with an appeal for low-cost porch lighting.

Much of the salesman's responsibility rests with low income customers. Here it is impractical to suggest the purchase of many new lamps. Consequently, simple adapter units, shades, reflector bowls, and appropriate wattage, are stock in trade. The customer, after hearing the story of light, may, if she chooses, make immediate purchases, or, she is asked to go to her favorite dealer with the prescription booklet, which tells the dealer exactly what is wanted. Salesmen will be checked by the actual amount of merchandise that goes from the dealers' shelves.

Here is a program. then, that makes three important contributions. First. it increases energy use with customers who are on higher steps of the rate. Second, it does a real service to customers by way of home beautification at small cost. Third, the salesperson knows that he has something to do. It keeps the sales force intact.

● TWO UNUSUAL PAGES of advertising recently appeared in a Vancouver paper. The pages offered a first prize of $25, second prize of $10 and eight other cash awards in an unique competition. The major portion of both pages was devoted to a reproduction of 69 neon signs used in and around Vancouver. The top quarter of one page was devoted to details of the competition in which the entrants had to decide which of the signs made the greatest appeal and the awards went to the ten entrants who came closest to the order of selection shown by the total vote of all entrants in the contest. The top quarter of the opposite page was devoted to a reproduction of a cut of the plant of Neon Products of Western Canada, beneath which a story appeared on the development of the company and of the neon sign industry in general.

IES Conclave Features Sales Aids

Lighting service committee to create forum on commercial applications of IES data

ESSENCE of the IES convention at Atlanta, was presented to the San Francisco Bay Cities Section. Illuminating Engineering Society, at its Nov. 12 luncheon by one of the two California delegates, Fred J. Wellhouse, Westinghouse Electric & Mfg. Co. That report contained several interesting viewpoints.

First was to derive effective use of the technical data developed by the IES for the benefit of the sales groups, the lighting service committee will be changed to a forum designed to put to commercial application more of the findings of the Society.

The progress report, usually devoted to display and demonstration of new light sources and devices, Wellhouse said this year significantly devoted itself more to the uses of lighting in higher intensities; application rather than new equipment.

Home lighting, he reported, is being considered as the field in which promotional effort will be put when the defense emergency lets down business.

Street lighting, according to an exceptional study made in Detroit, was found to decrease accidents when properly designed. The rate of accidents decrease up to the attainment of .8 footcandles on the street. After that visibility seems to be equivalent to daylight and accident rates balance off with the rate of day accidents. Higher intensities of illumination. therefore. the Detroit engineer had found, could not be justified on the basis of accident prevention.

Linear high voltage fluorescent strip lighting, according to reports given at IES, should be as efficient as the shorter individual lamps, basically. However, the problem is one of coating the long tube evenly. Light output varies in tubes having the same physical characteristics. Another problem is that much of it is made by small sign companies and there is no quality standard among them. No lumen output is known in many cases. Need for help from the IES was indicated. Such linear lighting has much to commend it in certain srtuctural applications, however, and its growth will be rapid.

Seeking to explain basic reasons for the tremendous growth in fluorescent lighting, Wellhouse gave his opinion based on papers presented and other observations made. Defense industry has been one major reason. In such industries the money was put up by the government so that higher investment cost was not a resistance to be overcome. Likewise the smaller operating cost in current consumption was in its favor. The dividing line, on an economic basis, seems to be at about 9/10 cents per kw.-hr. on a 6,000-hr. operating cost basis. Lower brightness was another factor in industries where polished metals are being employed and scales and tools for accurate measurement required high intensity for seeing. The cost of lighting is only 1/10 of labor cost and if the quality of the product improves, lighting is cheaper to use than extra labor.

Another important paper was one by Luckiesh and Harrison called "Comfortable Seeing." In it nature is taken as the example for comfortable seeing. A clear day, with surroundings such as woods and ground of darker color than the clear blue sky overhead, provides the minimum of contrast brightness. About 2/10 of a footcandle is reflected directly back into the eyes. Yet high intensities are diffused over the surroundings as they are seen.

Indirect lighting, particularly where of high intensity, has the same characteristics as a bright, overcast sky and often reflects too much direct illumination into the eye. The comfortable seeing level seems to require about 100 footcandles on the objects to be seen, provided the brightness contrast thus produced does not violate the 1 to 10 ratio of light reaching the eye. For this reason, the fluorescent lamp, fitting into the physical structures of the ceiling, lights to better advantage than bright point-source incandescent lamps. It can be applied intelligently with directional control in offices, schools and homes in such a way as to attain a high level without permitting high brightness to reach the eye. Moreover, at high footcandle levels, such as 100, specular reflection, like headlights burning during daylight, are not seen uncomfortably.

The meeting was the first presided over by the new chairman Walter Carlson. John Walsh, chairman of the educational committee, reported on the exceedingly successful lighting school conducted by the Section at Sacramento and San Francisco with enrollments of an average of 66 and 73 respectively. After a two months' winter vacation, the second series will begin in January. Out of the activity may possibly come a chapter in Sacramento. Another course is being considered for architects and architectural draftsmen.

And in Montana . . .

To announce a new 100% dealer cooperative promotional plan and to stimulate a light conditioning program among dealers in Montana, a series of meetings was held under sponsorship of Montana Power Co. a month ago. With crowds ranging from 35 to 125, meetings were held in Livingston, Bozeman, Missoula, Helena, Billings, Lewistown, Harver, Great Falls, and Butte.

Prefaced by a talk from D. J. McGonigle, general commercial manager, the program included a talk by Dorothy Stewart, home service director, followed by Bert Heinz, Northwest representative, Light Conditioning Sales Service, Seattle. McGonigle told of the full support of commercial and industrial, home service and dealer cooperative departments. Miss Stewart told of the demonstrations conducted by home service girls and Heinz told of the opportunities for dealers in the sale of lighting conditioning equipment. All of the meetings were preceded by a dinner prepared electrically by the home service girls.

No. Calif. Appliance Push

To make sure that some of the Christmas shopping this year shall continue to be for electrical appliances, even though there may be shortages in some items, the Electric Appliance Society of Northern California is conducting a modest campaign among dealers in its territory. Window banners, counter and window-display cards are being furnished to dealers. Publicity releases are sent to newspapers for incorporation into local advertising pages. The Pacific Gas and Electric Co. has carried large newspaper advertisements directing buyers for electrical wares to dealers' stores. The bill stickers were also sent to the entire list of resident consumers.

Joining with other electrical groups such as the Northern California Electrical Bureau, the Electric Appliance Society is also assisting in the program of the Outdoor Christmas Tree Assn. throughout northern California. In San Francisco the Examiner and the Federated Women's Clubs are sponsoring a contest. Chambers of Commerce, women's clubs, and other civic groups in other cities and towns are carrying on similar activities. Clark Baker, lighting counselor, Northern California Electrical Bureau, made a number of talks to civic organizations stimulating the idea of lighting up for Christmas.

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PRINT IN BINDING

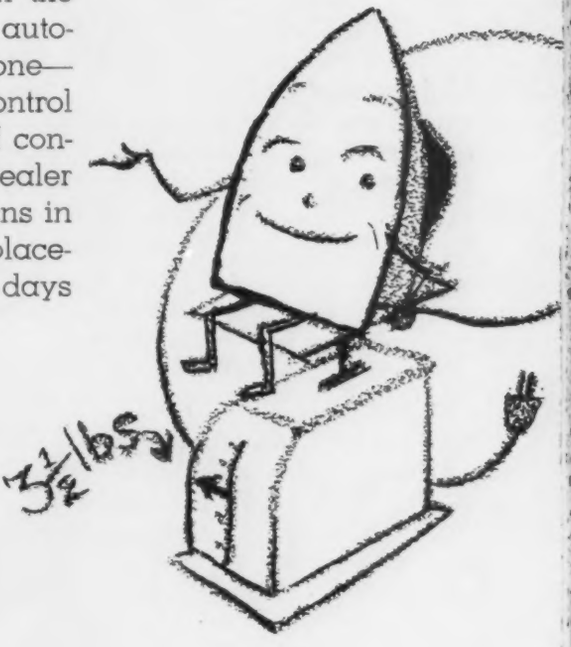
ELECTRICAL WEST

Sales Guide

Takes No More Metal

for an Automatic Iron --- Sell it instead

Top of the home priority list in electrical labor savers is the electric iron. In fact, for many years, throughout most of America, there has been no other means of ironing the family washing. It has been electric iron or nothing. So irons are not on the luxury list for curtailment. They can still be sold. Now an automatic, high grade iron takes no more metal than a cheap one—in fact less. It doesn't depend on brute heft to do its job. Control does as much as weight—in fact more. This refinement of control is worth more—to the customer first, and to you as dealer too because it offers a better profit. Only about 20% of irons in use now are automatic. That in itself offers you a wide replacement market. Besides, all the new families starting these days deserve to be sold an automatic iron.



AUTOMATIC IRON

DECEMBER 1941

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AUTOMATIC IRON

Selling is fun

WHEN YOU KNOW YOUR STUFF!

Sell this idea---

More Work for the Iron Less for the Wife

Only a few seconds in which to ask a quick question—that may be all there is when a customer asks for an electric iron. She may be impatient if you try to go into a long discourse. But with the right question, she will listen a minute. It is vital that the question you ask pictures to her quickly one idea—that with an automatic the iron will do **more** of the work, she will do less.

Remember, she doesn't think ironing is a pleasure—it takes too much standing. It is woman's toughest job sometimes and to try to say that it can be made a joy insults her intelligence. She **knows** it is hard work. Admit it, but offer to make it a lot **easier.** Do it all in that first question. Something like this:

"Have you thought about an automatic iron? It could save your strength so much, make the job of ironing a lot easier. Let me show you why."

That is a tested question, one used by salesmen successfully as an opener. It causes hesitation, makes a chance to tell the advantages of an automatic and in more cases to sell it instead of the ordinary iron.

If the customer gives any indication that she is or can be interested, bring out the automatic and weave benefits in with your description of its particular design and make. Reason it this way: the special features of the iron and the reputation of the manufacturer will mean so much more to her if you tell of them **along with** the usefulness of the automatic iron.

One advantage may appeal to one person, another to a different person in different circumstances. Size up the prospect quickly

and follow that first question with one of these positive reasons why of an automatic. Notice that each one offers to make the job of ironing easier, each one is a modest yet truthful statement. Each one builds a case for the superiority of the automatic iron.

"It is much lighter, that's why it saves your strength. Feel its weight in comparison to an ordinary iron. Think how many times you have to pick up an iron during the course of an ironing. Every time that extra weight takes extra energy from you. This iron depends on its accurate heat control for results instead of sheer weight."

"It is easier to use besides. It is better balanced. It steers more easily through materials. The shape of the handle is restful to the hand."

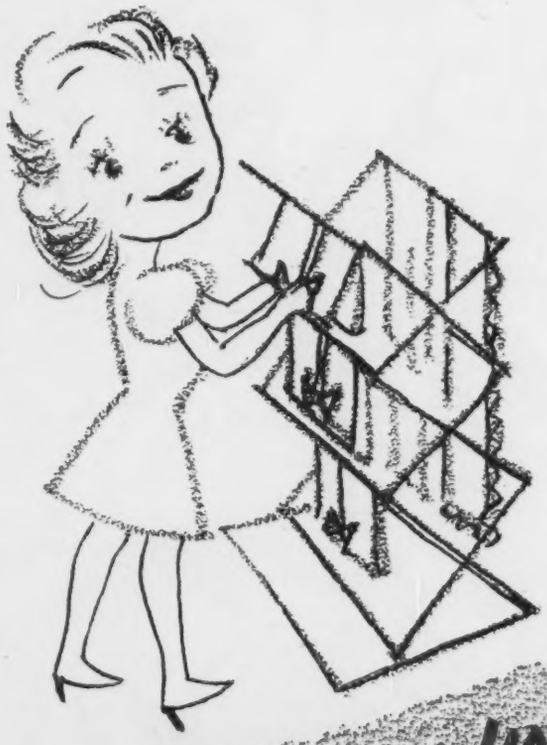
"It protects your rayons and synthetic silk materials that are so critical to extra heat. This is going to be more important than ever if such materials cost more or become hard to get in the future. A wee bit too much heat can ruin them. The automatic heat control is good insurance to your garments. It prevents scorching of linens too."

"It heats fast, takes just a few seconds, turns itself off. Saves you current, saves time. You can take your time ironing and still get through faster."

"It is a safer iron. When you set the heat control it will stay at that temperature. Even if you should forget and leave it on, it will not do any damage. Protected against overheating the shoe stays bright and smooth."

"The cord lasts longer, it is sturdier and being permanently attached does not have to be pulled out to turn off the current. This eliminates frayed cords that sometimes break and sputter and blow fuses or make radio interference."

With many of the newer models various steam making devices are incorporated. This added characteristic should be described in terms of the **performance,** not just the steam. Such added benefits raise the value of the merchandise because the services they perform are worth a lot to the purchaser, not the little bit of metal or plastic that does it. It is this added value that sells up.



and We'd like you to Succeed at it!
PUGET SOUND POWER & LIGHT CO. • WASHINGTON WATER POWER CO. • PORTLAND GENERAL ELECTRIC CO. • CALIFORNIA OREGON POWER CO. • UTAH POWER & LIGHT CO. • IDAHO POWER CO. • THE MONTANA POWER CO. • ROCKY MOUNTAIN ELECTRICAL LEAGUE

"Stuff" to Know

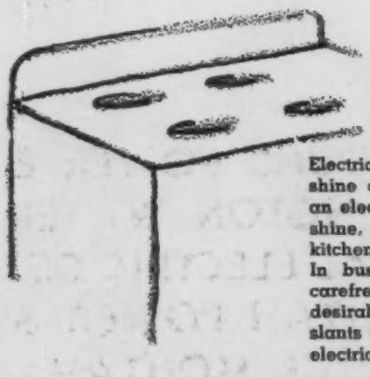
The Touch that Convinces

Feeling is believing, as well as seeing. One touch often leads to a sale if this easy way of demonstrating an automatic iron is followed. Show it to the customer near an electric outlet so that you can plug it in. Ask her to put her finger against the sole of the iron as you plug it in. In just a second it will heat up so that she will withdraw her finger. That gives you an opportunity to say:

"Doesn't it heat up quickly? That fast heating saves you time and money. Let me explain . . ."

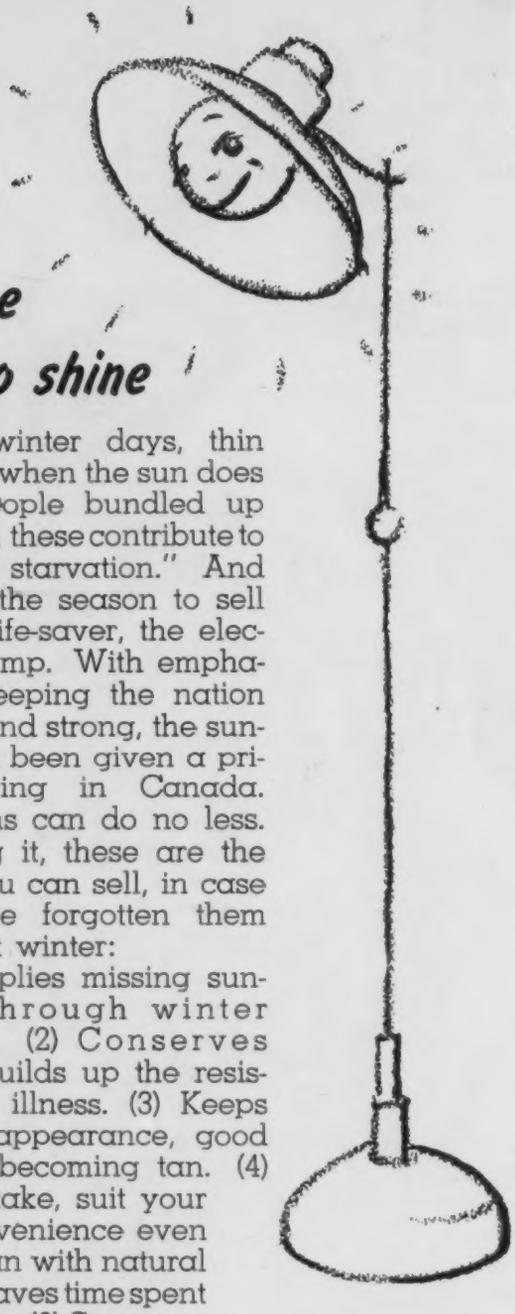
Then go on to tell why—just that touch will have impressed her of its speed in heating. The thermostat idea to control heat and its advanages in time saving, labor saving and current saving can all be told then convincingly.

If you conduct an appliance repair business a small but handy display of automatic irons will be profitable near the service counter. Many an old iron can be retired in favor of a new automatic with a little explanation of the differences and additional advantages to be had with the new automatic.



SUNSHINE COOKERY

Electric cooking is often called "sunshine cookery" because the heat of an electric range is as clean as sunshine, cooks radiantly, keeps the kitchen clean and the cook cheerful. In busy and trying times such a carefree servant should be more desirable than ever. These are slants to sell the replacement ranges electric.



Let the Sun so shine

Shorter winter days, thin sunshine when the sun does shine, people bundled up more—all these contribute to "sunlight starvation." And all spell the season to sell the sun life-saver, the electric sunlamp. With emphasis on keeping the nation healthy and strong, the sunlamp has been given a priority rating in Canada. Americans can do no less. In selling it, these are the points you can sell, in case you have forgotten them since last winter:
(1) It supplies missing sunshine through winter months. (2) Conserves health, builds up the resistance to illness. (3) Keeps healthy appearance, good color, a becoming tan. (4) Easy to take, suit your own convenience even better than with natural sun. (5) Saves time spent at a clinic. (6) Saves expense. (7) Quality is always the same, with sun it isn't. (8) Relaxes and refreshes, promotes restful sleep. (9) Easier to take than cod liver oil which the war has made it difficult to get, and expensive. A source of sunshine Vitamin D, helping the body absorb food, build sounder teeth, strong bone, resistance to infection. That is all safe ground on which to sell sunlamps—don't claim any more and the physicians will approve.

"Stuff" to do

Western Christmas Pageantry

Brilliant outdoor lighting displays are enjoyed by all in the true spirit of Western hospitality

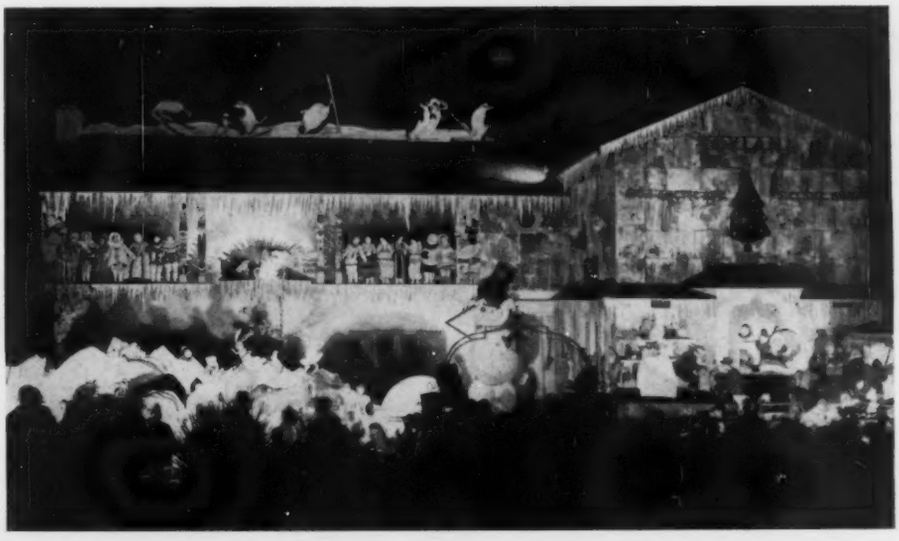
ONCE again outdoor holiday lighting will brighten the Christmas season in communities throughout the West—symbolizing in thousands of twinkling lights and gay, colorful displays our faith in peace on earth, good will toward men.

For over fifteen years organized "outdoor Christmas" groups in many Western states have annually striven to surpass the previous year's display of decorated homes, trees and gardens.. Not to be overlooked are hundreds of commercial establishments cooperating with large displays and spectacular lighting effects. To stimulate interest in creating outstanding lighting and decorative exhibits in California, the Outdoor Christmas Tree Assn. of California annually awards prizes for best photographs of displays throughout the state. Many other community organizations have contests for the most original and beautiful Christmas effects.

Some of the highlights of past years include the famous lighted Christmas tree lane in Fresno, California, with its two and a half miles of trees decorated and illuminated; the lighted Cedar of Lebanon in Santa Rosa, Calif., which marks the grave of the great Luther Burbank; lighting of intermittent trees along the Redwood Highway between San Francisco and Grants Pass, Ore., a distance of 425 miles; Altadena, Calif., with its famous old Christmas tree lane which has been brilliantly lighted since 1920, its avenue of lighted deodars, outdoor Nativity tableaux and shrines.

It is expected that over 150,000 outdoor trees will be lighted in California alone; that the West will light the skies magnificiently during another good Christmas season.

Shown here are colorful, representative Western homes and gardens and a commercial establishment—all garbed in light for passers-by to appreciate. Displays such as these have the practical value, in commercial houses, of attracting far more favorable attention than any mere advertising display.



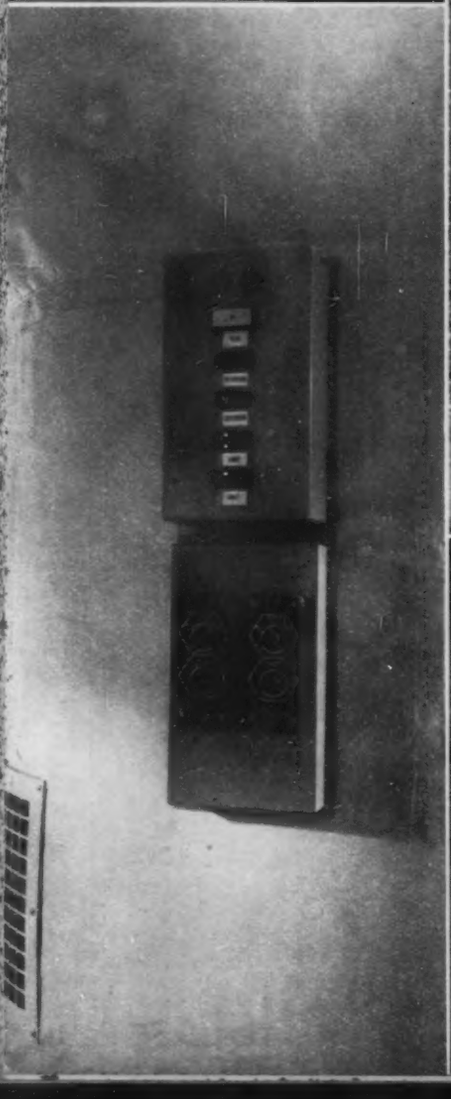
The Same—Yet Different

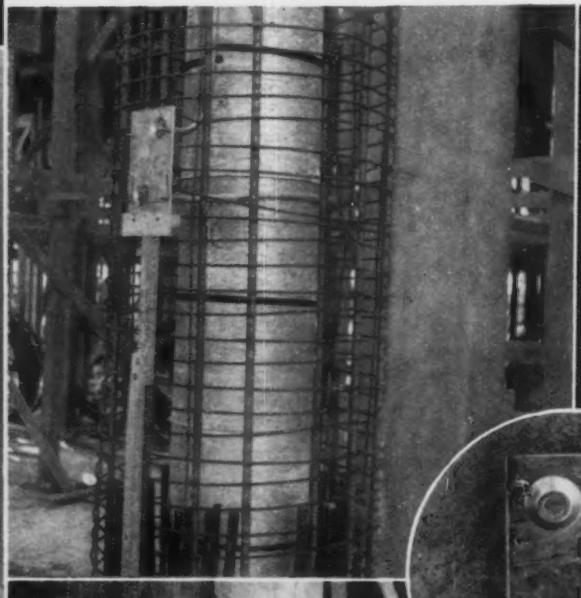
Standardized Post Office layout is treated with new technique by San Francisco contractor

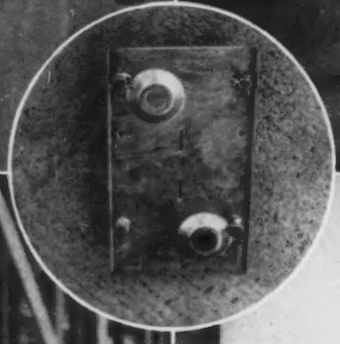
NEW ideas in the construction of a more or less standardized type of building distinguished the Rincon Annex Postoffice building in San Francisco completed about a year ago by Globe Electric Works, San Francisco and justifying by performance the particular design used.

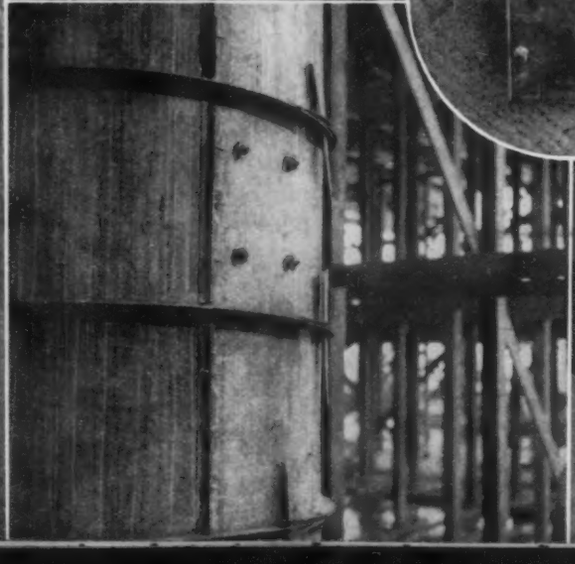
A standard working post office building in every respect as laid out by the Treasury Dept. public buildings branch in Washington, several innovations in wiring technique were developed on the job by the electrical contractor, Lloyd Flatland, manager of Globe Electric. The engineers at Washington had laid it out for a radial wiring system, itself new in this type of building. This consisted of the extension of the three-phase, 4-wire supply on a continuous branch circuit feeder system.

Lighting feeders were in 1¼-in. conduit with four No. 6 wires, to provide a 50-amp. capacity at the end of each circuit. Lighting control and circuit









At left, above, one of the circuit load-centers with thermostats attached to side of can, lock over plug circuit switch. Left, below: Load center and below it, push button control for conveyor. Below, center insert: close up of back of one of the metal plates. Other pictures show plate set as to height in reinforcing before fastening to metal form, bolted to the form, after stripping, and with can mounted, showing height from floor. Note conduit circling the metal vent duct in the center of the column. Indentation of plate allows space for conduit locknuts

protection were combined at load centers located on the columns, from which No. 6 branch circuit feeders were extended by No. 10 wire taps to the ceiling outlets. The load centers consisted of circuit breakers to act both as a circuit breaker of 20-amp. capacity and as a lighting or plug outlet control switch.

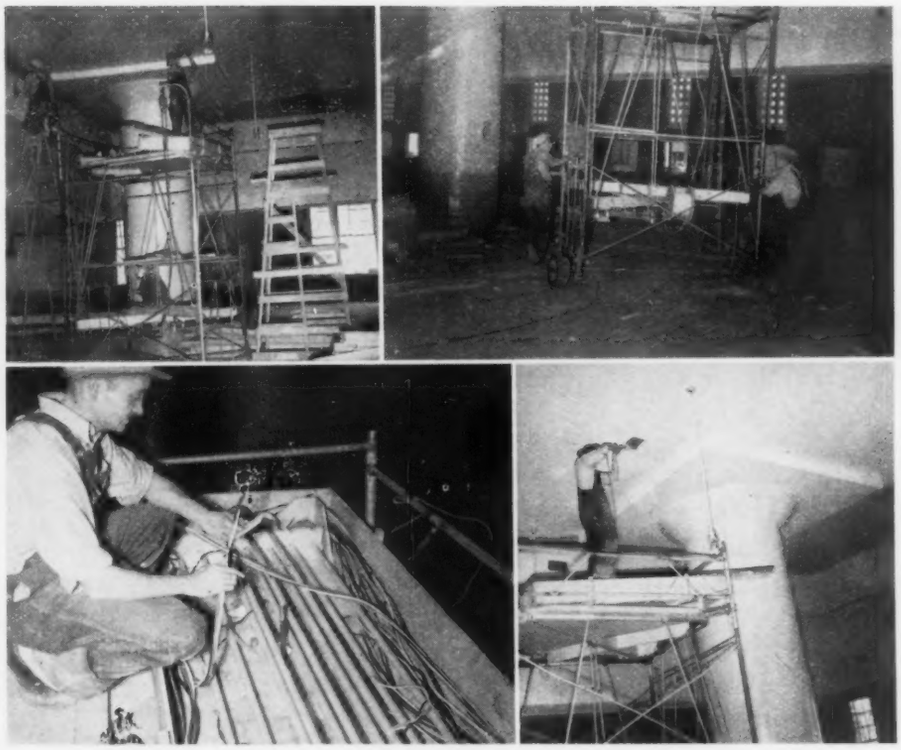
These load centers were installed 6 ft. 6 in., from the top of the can to the floor. They contained a duplex convenience outlet, with its own circuit breaker switch to which a simple locking device was attached to prevent unnecessary breaking of the circuit if it was used to energize portable equipment. The locking device, however, provided free tripping on overload. A blank outlet was also provided for a future circuit and its circuit breaker switch installed as a spare.

Location of such circuit breaker boxes on the columns usually is accomplished by setting in the concrete form a wooden board of the size of the circuit breaker can. This is removed later and the can inserted. This does not make a very neat job nor provide very secure anchorage for the can. The problem here was to arrange a mount on a circular concrete pillar, 44 to 58 in. in diameter. Through the center of the column a large ventilating duct of 18 to 24 in. in diameter was cast. To recess the circuit breaker can would take space necessary for reinforcing steel.

The load center was required to be installed on the surface in an exposed can or cabinet. To overcome difficulty in securing the conduit to it, cast in the concrete, and in order to avoid breaking or loosing of the conduit by the concrete vibrators when tamping the columns, the contractor developed a metal plate with proper knockout punchings indented and with attachment bolts welded to it. These bolts were used to pull the plate up to the metal circular form during the concrete pour and subsequently to affix the cabinet.

Since the columns were circular in order to provide a clean-cut, smooth appearance when the metal forms were stripped, special precautions were taken to provide a plate with flanges which would conform to the contour of the metal form. During construction, the plates were anchored in the approximate location and the service conduits lock-nutted to them. With the cooperation of the metal form contractor, holes were pierced in the metal forms in such a manner that the holes in the form could be flattened out and the openings sealed for re-use.

Electricians then leveled the plates, tightened the nuts and drew the plates to the form. Templates and jigs were used to guide the sheet metal form contractor so that the holes were pierced where needed. A neutral strap at the load center was made a part of one of the brackets that held the exposed cover. All neutral conductors were fastened to binding screws on this strap.



Movable scaffold on rubber-tired wheels at work, above. Left, top, working from the top, fixture hanger pulled into place. Right, top, moving the scaffold to a new position. Center, left, the fixture box, lifted to the platform by the outrigger arms, is opened and fixtures removed as needed. Right, soldering connections from the scaffold in a home-run pullbox

Circuit breaker switches were bused together with the No. 10 identified wires feeding the panel.

The merit of this system of distribution has already proved itself in operation for continuous use of 500-watt lamps. Excellent voltage is served at the end of each home run feeder and lamps burn at normal voltage.

Where control stations were required for conveyors, etc., the load center idea was carried out in a similar manner. Similar plates were set in the column and a push button starter station arranged on the cabinet with circuit breaker protection. Ceiling type unit heaters are on thermostatic control; the thermostats were located on the sides of these load center cans thus avoiding exposed conduit runs anywhere.

In many instances, these same load center plates were used behind a motor starter switch also in order to conceal the conduit as well as support the starter can. There was no drilling of the columns to hang equipment and hence there will be very little hazard of tearing the cabinets off.

In some instances, load centers were installed on opposite sides of the column and a conduit raceway bent around the ventilating duct connecting the load center plates together for continuation of the No. 6 feeders or No. 10 taps.

Another novel construction idea was used in the main service bus from the power company transformer vault in the street to the switchboard in the subbasement. The job called for bus or cables from the power company manhole adjacent to the building. The building basement, however, is 4 ft. under the water level of the bay and some concern was felt as to possibility of flooding the basement should the manhole be flooded or if the water level ever raised above the cable entrance level. To guard against such a contingency, bus bar was used from inside the wall to the switch board bus, and paper and lead-covered cable continued to the power company's manhole.

Since the building is on piles and the power company manhole is not, it was apparent that the manhole in time would sink. Thus any moving or change would be taken up by the use of the lead and paper cable. A large bronze plate was set into the inside wall of the opening, gasketed to prevent leakage of water. Pot heads were mounted on both sides of the plate to which the lead covered cable was wiped and sealed on the outside and the bus bar affixed on the inside. A duct of alum-

Main switchboard in sub-basement. Covered bus to the bulkhead back of it at right. At right, floor outlet from underfloor duct system to serve postal machines

inum enclosed the bus bars on the inside to reduce current effects from proximity to the heavy current. Outside, a metal duct to connect between the building and the vault was protected by a concrete envelope.

Main switchboard has two main breakers, each of 1,200 amp. for power and lighting.

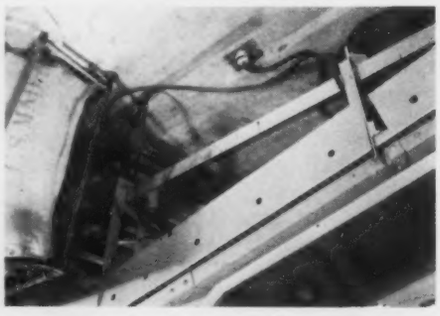
Because of the vast space covered by the 269x300-ft. building, with three floors and a future floor provided for, Globe Electric developed a movable scaffold for the mounting of general lighting units in the work areas. General lighting consists of 500-watt glass steel diffuser units on pipe stems equipped with swivel joints. They are mounted on 15x15 ft. 1½-in. centers, at a mounting height of 11 ft. The ceiling height is 19 ft.

The scaffold was constructed of thin-wall tubing. It is 9x9 ft. square, with an elevating platform providing a proper working elevation for the electricians. It was made demountable so that it could be taken to the job and demounted to take from floor to floor.

Outriggers ingeniously were provided at one side of the scaffold to lift the boxes in which the fixtures, complete for one row of lighting units were delivered to the job. This method avoided too much handling and possible damage to the circuit unit, previously wired. Fixtures were mounted and feeder circuit wires and taps were made at one operation from the scaffold.

The scaffold was equipped with automobile type steering knuckles and equipped with four small pneumatic balloon tires. A ladder gave access to the top from one side. An elevation range of 3 ft. of adjustment was possible from any fixed position. It was made

Portable conveyor is supplied power from a floor outlet equipped with a brass collar for water protection. The collar also takes the bumps instead of the plug cap and cord



in 5-ft. sections so that it could be adjusted to various ceiling heights or to permit removal of a section to pass under the suspended inspection galleries which crisscross the postoffice work area.

Main floor work space, showing load center located on the column, the lighting units, and one of numerous portable conveyors. One unit heater at ceiling.

Edison Supports A-W with Advertising

A valuable foundation for adequate wiring sales activities of the Southern California Edison Co. is contained in the company's advertising and publicity activities in the field. Under the direction of R. G. Kenyon, advertising manager, varied and vigorous promotion is given adequate wiring to customers, architects and building contractors.

For more than a year, *Electrical Times*, little magazine accompanying service statements to 350,000 consumers, has been advising customers of the benefits of modern wiring. The stories have been varied in presentation. Some have been illustrated with cartoons interpreting adequate wiring in terms of daily life incidents, with humor frequently employed. Others have featured customer acceptance, picturing an adequately wired home and pointing out the conveniences the owners are enjoying from their wiring facilities.

Recently *Electrical Times* has offered free copies of the Pacific Coast Electrical Bureau's four-page folder on Red Seal wiring. A large response has been received, and this folder has been placed in the hands of many prospective homebuilders.

Further public appeal is made through a homebuilding news service sent weekly to newspapers. The service consists of brief articles—many under 100 words — putting a brisk, popular interpretation on facts the homebuilder should know about wiring. These are intended for the newspaper's building page, which so many publications carry at present. Newspaper display advertising space is run on some building pages.

Lighting Experts vs. Buyer's Desires

By J. Lloyd Kamm

Illuminating Engineer

MANY a salesman can relate any number of instances wherein a client has turned a cold shoulder toward a "correct" lighting job, offering no further explanation than ,"I don't like it!" He can show a number of well designed lighting installations that are not being used simply because the illumination is not pleasing for the people who are to use it.

Furthermore, much to his surprise, the salesman has encountered instances in the course of his work in which people have been found thriving under a type of lighting which "modern practice" would acclaim as being not merely *poor*, but *terrible!*

From such experiences, it becomes apparent that lighting sales technique is incomplete, and that we are not consistently supplying a type of service that meets the customer's needs in a satisfactory manner. If the service is out of tune with him or his business, we cannot expect him to make generous use of it. Since lighting is a commodity that depends upon the customer's use of it for sales of electricity and lamps, it also follows that if the service is not satisfactory, the sales effort expended has but little *permanent* value.

To the trained lighting man the preferences various people express for what the lighting man knows to be poor or incorrect lighting are something of a mystery. While many will argue with Mr. Kamm on his conclusions, it is to be said for him that he has approached the subject from a study of human beings and their types and likings rather than what is "good for them."—The Editors.

In giving thought to this situation, does it not seem that the precept used for lighting sales is too limited? Certainly, light is *more than* an essential for vision! May we not also regard it as an *energizing, stimulating agent* which is an essential for life, growth and activity?

In giving attention to the needs different people seem to feel for illumination, it is found that very definite correlation existing between the nature of the person, the type of work he enjoys or is qualified to do, and the type of lighting he finds satisfactory. Fortunately, it is found too that people engaged in a given activity usually have sufficient in common to make the use of a general lighting system satisfactory for the group. In fact, this problem finally resolves itself into one of providing group lighting.

Such a program is not one that attempts to provide a special lighting effect for each person. That usually would be prohibitive and impractical. The individual is studied as a means of learning the characteristics of the group and of their requirements for illumination.

For instance, there is the out-of-doors type of person who is fond of bright sunlight and whose nature is inclined towards a muscular expression. He makes great use of the body and re-

THE KEY TO HARMONIZED LIGHTING

A CHART SHOWING THE PSYCHOLOGICAL REACTIONS WHICH DIFFERENT TYPES OF PEOPLE GIVE TO EACH OF THE MORE COMMON TYPES OF LIGHTING EFFECTS

CHARACTERISTICS OF THE MORE COMMON LIGHTING EFFECTS	TYPES OF PEOPLE				
	I. PHYSICAL			II. MENTAL	III. SPIRITUAL
	1. Muscular	2. Material	3. Mental		
1. BARE LAMPS High brightness of light-source; low mounting height of unit; radiant light; presence of sharp shadows; poor distribution of light producing a condition of gloom and glare. NATURAL EXAMPLE: *Intense sunshine.*	EXCITING ACTIVE LIVELY ↑	INTENSE PHYSICAL ACTIVITY	ANNOYING	IRRITATING	IRRITATING
2. OPEN REFLECTORS Light directed in downward direction from source; moderate mounting height; dark ceiling; high intensity of light on the working plane; radiant light; sharp shadows; and reduced glare. NATURAL EXAMPLE: *Moderate sunshine.*	PHYSICALLY ACTIVE	CONCENTRATED PHYSICAL ACTIVITY ↑	PHYSICALLY ACTIVE	ANNOYING DEPRESSING	IRRITATING
3. ENCLOSING GLASS GLOBES Lower brightness of light-source; moderate mounting height of unit; diffused light; soft shadows; high uniformity of illumination throughout the room; moderate intensities. NATURAL EXAMPLE: *Overcast sky or shady location.*	REFINED QUIET	MENTALLY ACTIVE	PHYSICALLY AND MENTALLY ACTIVE ↑	PHYSICALLY ACTIVE	ANNOYING PHYSICAL ACTIVITY
4. INDIRECT LIGHTING Concealed light-source; low brightness of apparent source (the ceiling); high mounting height of apparent source: upper section of room well illuminated; soft, well diffused light; very soft shadows; moderate intensities and exceptionally high uniformity of light distribution. NATURAL EXAMPLE: *Twilight*	DEAD	HIGHLY REFINED	MENTALLY QUIET	MENTALLY ACTIVE ↑	PHYSICALLY AND MENTALLY ACTIVE
5. TEMPLE LIGHTING A very low intensity of indirect lighting supplemented by occasional points of local lighting having small but bright light sources (as candles) NATURAL EXAMPLE: *Moonlight or Star Light*	DEAD	DEAD	DULL	MENTALLY QUIET	MEDITATIVE ↑

quires little in the way of individual thinking. In supplying lighting for these *muscular* types of people, it has been found that they demand that the lamp "shine" and that it possesses a very bright source.

In many of these instances, the use or application of bare lamps has proved satisfactory to them as it provided the *direct, radiant effect* and had a very bright source. This unit—like the sun at midday—should be mounted high above the line of vision as a means of reducing glare.

Then, there is the *material* type of people who identify themselves by operating material devices or machines, doing work of a dutiful or routine nature which requires but little in the way of individual thinking. Since these tasks are usually of a concentrated order, the use of local lighting finds favor as it tends to focus attention upon the central point. Likewise, general lighting systems serving these people (in machine shops, markets, novelty stores, etc.) also use open reflector types of equipment to advantage.

The third type of people to be considered is the *mental group* of the physical type. (Since the preceding groups use their bodies as a means of expression, they also are sub-divisions of the *physical types of people*). As the name suggests, these people prefer work which involves a combination of physical and mental activity.

For the most part, their thinking deals with *people and things*. While they enjoy daylight extensively, their preference is a shady location or the light from an overcast sky. For that reason, they take to the indoors where they are protected from the direct rays of the sun. Their choice of artificial lighting, oddly enough, is an application of the opal glass globe system. These people make excellent merchants, physicians, industrialists, transportation agents, etc.

The true *mental type* of person is much different from those previously mentioned. Such a person's body serves his head. His thoughts deal with *ideas and ideals*. Physical activity is foreign to his nature. He is a lover of the twilight, and, as may be expected, nothing meets his liking more than indirect lighting.

Occasionally the lighting salesman encounters an individual who requires low intensities of soft light. These people are very sensitive. Seemingly, they find expression in passive thought or meditation, and their interests are not akin with the commercial or industrial worlds. The starlit sky provides the type of lighting they prefer. For the want of a better term, call them the *spiritual type* of people. They are usually found as inspirational writers, musicians, artists, etc.

Saying that there are five types of people naturally implies that one must observe the intermediate or combination types as well. No confusion will be experienced if the manner in which the person makes a natural expression of his being is observed and that information is used as an index.

It is important that the distribution of people into these five groups be considered. To illustrate this situation, divide a pyramid into five horizontal sections or layers each having the same or equal height. The volume of the bottom section would then represent the number of people belonging to the *muscular* type; the second representing the *material* type, and so on with the upper or top section representing the number of people to be found in the *spiritual type*.

As a means of condensing this information into a more useful form and also showing the reactions of each type of people to the other types of lighting, the chart on the preceding page has been prepared. The natural expression of of each group of people has been shown in relation to their reaction to a satisfactory type of lighting.

It becomes apparent that such information offers a number of sales opportunities. For instance, it gives an index to the types of lighting to sell to various types of customers. It enables the salesman better to understand the customer's point of view as well as his particular problem. It suggests a method for solving those mystery problems wherein the customer has been complaining of poor lighting when he had a "correct" lighting job installed. It gives a new basis for the development of equipment. All of these make for better business and improved business relationships.

Infra-Red Speeds Drying

Auto shop paint drying time cut to thirty minutes by car-size battery

A car can be taken to Lester Motors, Ltd., in Sacramento for a new paint job in the morning and delivered that afternoon with a new baked enamel finish equal if not superior to the original factory job. Actual painting and drying time is under 30 min.; 15 min. in the spray room and from 12 to 15 min. under the infra-red lights and the car is rolled out completely dry.

The drying time varies slightly with the color of paint used, taking slightly longer with lighter colors. Timing cycle is controlled automatically by a time switch set by the operator for whatever baking period is desired.

The drying room at Lester Motors is totally enclosed. Volatile vapors are driven off from the lamps and removed from the room through an exhaust duct. This is the first installation in PG and E territory of an oven refinishing shop large enough to accommodate an entire automobile. The oven is made up of 350 240-watt Nalco Dritherm lamps with aluminum reflectors mounted on channels. The channel units are made up into panel sections of various sizes containing from 12 to 36 lamps per panel. Installation was designed by Cesar Co., Pasadena, and installed by Geo. Foss, Sacramento electric contractor.

These installations have great flexibility. This was designed to be used on a variety of paint refinishing work from refrigerator cabinets to complete automobiles. By means of the various-sized panels and a flexible switching system, it is possible to make up an over of any desired shape or size. Total connected load is 84 kw. at 240 volts, 3 phase.

Shown at right is the Lester Motors new infra-red drying room equipped with 350 250-watt Nalco Dritherm lamps with aluminum reflectors mounted on channels. Flexibility is a feature of the installation; various-sized panels and a flexible switching system can take on any job up to the full car as right

EMEA *Dope Sheet* — *Edited by Howard C. Park*
EMEA of So. Calif

Brushes—Their Selection and Care

Part II of a concise summary of what to look for and expect from motor brushes

The spring pressure applied to brushes has a marked influence on brush performance. If equal distribution of current and emf. between brushes is to be attained it will be necessary to have equal brush pressures on the commutating surfaces.

The spring tension, for grade of brush installed, should be adjusted to conform as closely as possible to the value recommended by the brush manufacturer.

Too *heavy* brush pressure will promote mechanical wear.

Too *light* brush pressure will promote electrical wear.

Brush pressures are recommended in terms of pounds per square inch of cross sectional area of the brush. To determine the actual pressure which should be applied to a particular type of brush, multiply its cross sectional area, in square inches, by the recommended pressure.

Generally recommended pressures for industrial service are:

1. Soft graphite grades	1¼ - 2	lbs. per sq. in.
2. Firmly bonded graphite grades	3 - 4	lbs. per sq. in.
3. Carbon and carbon graphite	1¾ - 2¼	lbs. per sq. in.
4. Electrographitic	2 - 3	lbs. per sq. in.
5. Traction service brushes	5 - 7	lbs. per sq. in.
6. Metal graphite. (Slip Ring)	2½ - 3½	lbs. per sq. in.

Brush Position

Brushes should be located at the point where best commutation is obtained. The point of best commutation will depend largely on the stiffness of the main field and the amount of load current. In general brushes should be located at or near the no-load neutral of the machine.

The brushes on a bipolar machine are set at approximately the no-load center between the poles. If the machine is equipped with interpoles, the brushes are set at the center line of the interpoles.

The brushes on a multipolar machine are set somewhere near the center line of the main poles. If the machine is equipped with interpoles, the brushes are set at the center line of the main poles.

The brushes on generators should be shifted from the no-load neutral in the direction of armature rotation.

The brushes on motors should be shifted from the no-load neutral against the direction of armature rotation.

Location of No-Load Neutral On Interpole Machines

It is important for other reasons in addition to commutation that brushes be set at exactly no-load neutral on interpole machines.

Several methods for locating the neutral point on interpole machines are in use. They may be grouped in three classes: (1) voltage tests, (2) speed tests and (3) torque.

Before applying any of these methods it is important that brush spacing, pole spacing and air gaps have been accurately equalized in order to insure symmetrical division of field flux. Correct polarity relationship of interpoles to main poles should also be checked.

Commutator Film

Experience has shown that the proper amount and quality of surface film is highly desirable and beneficial in satisfactory commutation.

Various factors may enter into the formation of commutator film, many of which may be extremely undesirable; however, in many cases they may be controlled by the type and composition of brush used.

The proper amount and quality of commutator film tends to reduce friction, improve intimacy of contact between brush and commutator, and may assist in maintaining the interface resistance between brush and commutator at a value necessary for good commutation.

Contact Drop

It seems evident that a potential drop between brush face and commutator of approximately 1 volt but not to exceed 3 volts, may be needed to control properly the voltage in the armature coils short circuited by the brushes.

The control of the contact drop may depend upon the grade of brush used.

Brush Wear

A brush should be of such quality as to withstand normal electrical and mechanical wear, that is, providing all of the foregoing factors have been properly watched. Should the brushes show excessive wear even though the foregoing factors have been properly attended to it is more than likely that the cause of wear will be either bad commutator condition, electrical or mechanical disturbances in the machine, excessive heat, humidity, chemical reaction or air born particles.

Fumes from carbon tetrachloride, oil, gas, paint, turpentine, acetone, alcohol and many other chemicals are extremely detrimental.

Electrical *wear* will cause the positive brush to wear the fastest on a generator and the negative brush on a motor and a synchronous motor.

While the installation and maintenance of brushes and brush assemblies is of paramount importance for good brush performance it is difficult to say definitely what is the most important property in a brush. The characteristic which makes a brush an ideal selection for one application may be of secondary importance to some other property on another machine, operation or location.

The relative importance of individual characteristics, for any particular application depends upon the unfavorable factors which must be overcome.

The theory of commutation and the function and care of the commutator have been studiously avoided in the Dope Sheet, as these will be considered in later issues.

EMEA "Double Bill"

No. Calif. group hears talk on elevators; inspects new SF job

Electrical Maintenance Engineers' Assn. of No. Calif. featured a double-bill at their Nov. 13 meeting at the El Jardin in San Francisco. "Educational Developments for Elevator Service Engineers" was the topic presented by J. A. Bevoda, maintenance supervisor, Otis Elevator Company. The talk was illustrated by projection slides.

Following the address by Bevoda, the meeting adjourned to the new Bank of America Building in San Francisco, where the membership inspected the latest Westinghouse installation. The inspection tour was directed by Gano R. Baker, Westinghouse Electric Elevator Co. This "talk-and-tour" program was voted enthusiastic approval by all those who attended the meeting.

ELECTRICAL WEST

McGRAW-HILL COMPANY OF CALIFORNIA
68 POST ST. SAN FRANCISCO

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San Francisco Says "No"

LONG before last month's San Francisco Hetch Hetchy election, it became apparent that the outcome of this local balloting might have a profound national significance. It had been evident for months that the New Deal power program had bogged down. Things were not going well in Nebraska, and down in Oklahoma a PWA financed project faced bankruptcy. In Texas as well, there were rumblings and grumblings. REA was having its troubles. In the TVA a storm of protest had developed against the latest dam which would flood thousands of acres of valuable farm land. Congressional committees had been questioning power appropriations and had eliminated several. So it was logical that the San Francisco election should get "the heat" from the federal people. A cabinet officer made a personal appearance and an impassioned appeal. The President, in a press conference, "commented" on the San Francisco situation and later there was a statement from the White House. Several Congressmen had a word or two to say.

To what avail?

On November 4, the voters gave municipal distribution its eighth setback, by a majority that left no doubt as to their feelings. At the same time they told federal proponents of public power that their meddling was purposeless and their proposals so much bunk. If the elected representatives of the people are guided by the wishes of their constituents, then here is a mandate for a lot of Congressmen.

An Indefensible Blackjack

"SO, DAS ist Amerika!" Yes, so this is America! Consider the following public statement by Bonneville-Coulee Power Administrator Paul D. Raver: "The Bonneville administration has offered the Portland General Electric Company a choice of two contracts. The first is a long term contract with a provision for resale rates; a stipulation that the company sell immediately its Clark County, Washington, and Woodburn, Oregon, distribution systems to the public agencies formed in those localities; and an agreement to sell the balance of its property in its entirety and on an agreed price basis to public agencies when and if formed in its territory. The company has not accepted the terms of this proposal. The second contract proposal is for a renewal of its present short term contract with a stipulation that the company sell its distribution systems in Clark County and Woodburn immediately."

In an enlightened democracy it is difficult to believe that any governmental agency would apply this kind of pressure in dealing with an industrial organization or a private citizen, either, for that matter. Yet here is a creature of government, established by law, indulging in a kind of blackmail that would arouse a great outcry were the practice reversed and the company, instead of the federal government, be making the stipulations.

Just a few weeks ago, the voters of San Francisco gave a vehement demonstration of what the public thinks of federal interference in matters of local electric supply. It is regrettable that the people in the territory served by Portland General Electric Company do not have a similar opportunity in this instance. Under the circumstances they can only express themselves as did the editor of the Salem *Capital Journal*:

"It would be encouraging and refreshing to see the Bonneville crowd attending to its own business—that of generating and wholesaling power—and let individuals and communities decide for themselves who they want to buy their electricity from. If the cities and the PUDs want to take over private utilities they have the power of condemnation. They don't need the help of Bonneville to bludgeon the companies into line."

There Will Always Be Salesmen

THE SALESMAN who sold us our last two cars was in the office last month. He was out of a job after eight years with this one dealer. In letting go their sales force, the two partners who own this dealership told the men that they

personally were going to handle the job of "letting customers have such new cars as will be available." No salesmen would be needed for that. They expected to have far more prospects than they would have cars to deliver. However, our salesman friend wasn't worried. He had talked to one of the partners that morning and things weren't going so well. There hadn't been any rush of buyers. In fact the partner had lost two sales the day before because in neither instance could the prospect muster the one-third down payment required under Federal Reserve Board regulation "W." This one-third down and a maximum of 18 months on the balance was proving a tough hurdle. Especially when compared with the old $100 down and 24 or 36 months if the prospect had a good rating. So our salesman friend was considering this present interlude as a needed vacation. He expected to be back *selling* in a very short time.

If this was a parable, we could point to the moral for the electrical industry. It shouldn't be necessary, however. The parallel is apparent. There is no evidence yet of the public rushing in to *buy* the appliances in which shortages are expected. Best guess is that they won't. So the manufacturer, distributor, dealer or utility that is putting the ax to his sales force had better think twice. There will be a job of selling to do. And trained salesmen will be needed to do it.

Paying For Defense

NATIONAL defense costs money. It costs manpower, resources, reduced standards of living and certain liberties. But by the same token we are preserving these very same things for our own future and the future of generations yet to come. So we as citizens, we as business or industrial organizations, should be ready and anxious to pay for the national defense program to the best of our individual and collective abilities. One way to exercise that ability is in the purchase of defense savings stamps and defense savings bonds. That is the patriotic, American way of meeting the defense emergency.

There are other reasons for such purchases—selfish reasons at that. The unprecedented commercial and industrial activity is resulting in a tremendous expansion of national income and an increasing shortage of consumer goods. Economists agree that this spells inflation unless some of these payrolls can be diverted into savings. Inflation will spell disaster for many businesses. Moreover, savings now will provide for a rainy-day fund for any post war recession.

Some companies are setting up salary allotment purchase plans. Others recommend that employees use the facilities of the banks or the government itself. Whatever system is available, use it. Buy defense bonds now.

Not Through the Windshield

SLOWLY the machinery of distribution in appliances and wiring materials is slowing down. Strangely, more of the slowdown comes from the use end of the chain than the factory end. Distributors and wholesalers are not nearly as poorly stocked as the contractors and dealers seem to think. And the public seems to think the situation is even worse than it is.

Result is a voluntary stoppage of house building, remodeling, repairs even, and a denial of the urge to buy many major appliances. The propaganda is taking hold even better than expected and in some ways perhaps too fast for the good of the national income. It might prove better if the deceleration were not so fast. Nobody should be thrown through the windshield if it can be prevented.

The adjustment process taking place hits disproportionately hard in some quarters. It is in the public interest to strive to maintain as much business among small businesses as possible. The defense program can slow down from the back resistance of those it dislocates. If it is to go ahead at full steam, every effort should be made to keep normal life rolling along with it until it can make necessary changes of pace smoothly.

REGARDLESS of defense needs, the American people can have and maintain just as high a standard of living as we are willing to bend our minds and backs to work for. It is an unfortunate thing that, for better or worse, emphasis has been placed during the past decade not on how much one man can do, but on how many men we can get on one job of work. Higher levels can only be attained by an increase of productivity. The emphasis must be placed on more efficient and productive labor, a more fruitful and expanding science, devoted and skillful management. The first job of management is to make every ounce of labor count for the most. In spite of every other theory, every ounce of labor must be wisely guided if it is to produce more than it consumes. Every action consumes. In order to have more wealth to share with labor, management must see that labor creates more wealth than is consumed in the process.—Willard T. Chevalier, publisher, "Business Week."

PCEA Conclave Set New High for Interest

Fresno meetings find industry geared for defense emergency with sales, administrative and operating divisions awake to their responsibilities

RUNNING the gamut of subjects from responsibilities and opportunities for a sales department in the present emergency to problems of operation and construction in the face of priorities, the program for the annual fall conclave of the Pacific Coast Electrical Association kept almost 500 electrical men busy for two days at Fresno, Calif., Nov. 6 and 7. The conclave marked the return to an all-territorial meeting at a central point such as Fresno, after several years of separate northern and southern meetings. Business Development, Operating Economics and Administrative Services sections held both joint and individual conferences.

In keynoting the meetings PCEA President George C. Tenney pointed out that there has never been a depression, war, economic upheaval or national emergency but what the electrical industry has emerged more vigorous, prosperous and replete with opportunities. He called for renewed initiative and a turning away from precedent and tradition with a search for new and simpler ways of accomplishing the industry's purposes.

Nationally famous speakers addressed two joint luncheons. Davis M. DeBard, vice-president, Stone & Webster Service Corp., New York, in telling of utility operations in England during wartime, made a plea that industry employees in this country assume the attitude of service and sacrifice displayed by their British counterparts in promoting the success of the national defense program. President C. W. Kellogg of the Edison Electric Institute reminded those present never to forget that the public utility business in its customer and public relations, is essentially a local business. Speaking of defense power he pointed out that total power requirements are a function of the materials to which power can be applied. He indicated some of the places where priorities are liable to affect the industry adversely.

Each of the sections held at least one general session. That of the Operating Economics Section, under the chairmanship of Henry H. Buell (PG and E, San Jose), was devoted to a symposium on the "Interconnected Operation of California Electrical Utilities." N. B. Hinson (chief engineer, So. Calif. Ed.), who sponsored the symposium, traced power developments from the days of isolated stations to the present network, which through interconnections and paralleling points, permits energy transportation interstate if deficiency or economy should require it. Problems incident to the dual use of water for power production and irrigation as well as interconnections with water districts, mu-

Stone & Webster's Davis M. DeBard told about wartime utility troubles in England

nicipalities and oil refineries were reviewed by I. W. Collins (chief load dispatcher, PG and E). H. A. Lott, section vice-chairman (operating engineer, So. Calif. Ed.), discussed interconnections between southern California utilities, including emergency operation and the complications brought about by frequency changers. Describing the operation of the new 150,000-kw. inter-tie between Edison and PG and E. he pointed out that this is operated without either a physical or electrical interconnection due to difficulties in paralleling the two systems. Power is delivered by isolating generating plants and transmission lines.

Economics of system interconnections were covered by J. W. Andree (production engineer, So. Calif. Ed.) who pointed out that the present 150,000-kw. exchange was justified due to a surplus of power from Boulder Dam coupled with the pending large installation at Shasta Dam. E. A. Crellin (asst. engineer of maintenance, PG and E) concluded the symposium with a discussion of governing and speed control problems. He showed that whenever two systems are interconnected, the tie line must have sufficient capacity to carry normal regulating load swings with sufficient reserve to carry at least part of the emergency interchange. He demonstrated that the existing interchange capacity was not sufficient to permit system paralleling, since the combined peaks were in the order of 2,000,000 kw. and the short time combined system load increase at peak time exceeded tie line capacity.

Realities of today's administrative, customer service, commercial and sales, and personnel adjustments to the rapidly moving changes in world events brought together a record attendance for the sessions of the Business Development and Administrative Services sections. Earnestness, concern over trends, the effect on various trade groups, the industrial and agricultural future of customers of the utilities were all examined and the thinking of a variety of experts was exchanged for the benefit of all.

R. E. Fisher, vice-president in charge of public relations and sales, Pacific Gas and Electric Co., and chairman of the sales committee, Edison Electric Institute, appropriately was asked to open the meeting at the general assembly. Saying that possible shortages of appliances had been overstressed, he set the keynote for the meeting by urging study of other activities to which the sales departments could devote themselves. Likewise, he paid high tribute to the greater intra-industry understanding and solidarity now existing between the various groups in the industry. Into parallel sessions then went both the Administrative Services Section, of which Stanley W. Scarfe, General Electric Co., Los Angeles, was chairman, and the Business Development Section, over which E. G. Stahl, PG and E, Fresno, presided as chairman, to meet together jointly again on Friday for two general assemblies.

Wiring, priorities, agriculture, and taxes were swept before the conclave each by experts in their own fields at the Friday morning assembly presided over by Kenneth M. Ryals, Stone-Ryals Electric & Mfg. Co., San Francisco.

A. B. Smedley, Anaconda Wire & Cable Co., Los Angeles, presented his humanized approach to some of the

intricacies of wiring, power factor, load factor, and the uses of the new thin-wall wire for increasing adequacy in a talk which has brought him widespread fame, "Copper and Kilowatts" (an effort will be made to reproduce the essence of the talk in full in Electrical West later).

"Trends in Priorities" were not very encouraging to individual business and especially small business as reviewed by H. W. Wright, manager, domestic trade department, Los Angeles Chamber of Commerce. The trends, he said, were for greater restriction of civilian goods, concentration of consumer goods of a permanent nature, repair and salvage businesses assuming greater importance, an outcry from small business men with increased pressure on Congressmen for relief, a tendency toward allocations rather than priorities, and extension of rationing even into distributors' supply control. He recommended definitely that each firm appoint a competent man assigned to follow up and interpret the rapidly changing regulations. Likewise, he advocated thorough record keeping of all priority transactions and in production, simplification of lines and study of possible substitutes.

If "food will win the war and write the peace," declared Prof. H. B. Walker, U. C. College of Agriculture, Davis, in a strong plea for a consistent "food for freedom" program, farmers who are being robbed of their help by defense industries, must be permitted to acquire the machinery with which to increase production of necessary foods for America and its allies. Increased farm prices alone cannot produce the 24% more beef, eggs, milk, dried fruit, and cotton asked of California farmers. Curtailment of metal to farm machinery or even limitation of materials to many of the service industries which supply essential products to process or package farm products will put brakes on the food production so necessary.

Taxes are seldom a subject made clear or understandable. However, in his talk "Attacks of Taxes," Lane Webber, tax counsel, Southern California Edison Co., covered the subject understandingly and in a way that really hurt. Enumerating the various functions now assigned to taxation, from revenue, production, to the punishment of a variety of social ills, he pointed the danger not only to bankruptcy but to the complete loss of human freedom from present tax trends. Taxes, he said, are a part of the cost of living or of production and as they increase, a man must exchange more of his work or his product in order to pay taxes and survive. The money taken by taxes is never reproductive, seldom balances the waste and inefficiency even where employed on a so-called reproductive project.

The afternoon closed with a superquiz program in the nature of an "information please" panel answering questions previously sent to the PCEA. On the panel were Davis DeBard, Stone & Webster Service Co., New York; A. J. Bronold, Westinghouse Electric & Mfg. Co., Los Angeles; K. M. Ryals, Stone-Ryals Electric Co., San Francisco; S. G. Gates, General Electric Co., Los Angeles; A. E. Wishon, vice-president and asst. general manager, Pacific Gas and Electric Co., San Francisco; and W. C. Mullendore, executive vice-president, Southern California Edison Co. R. G. Kenyon, advertising manager, Edison company, was the moderator.

Summarized reports of the discussions held by each section are printed on the following pages.

Administrative Services

ACCOUNTING

Sponsor: F. C. McLAUGHLIN
Coast Counties Gas & Electric Co.

Subjects under discussion on a full round table basis covered a wide scope of accounting interest. Included were the following: functional accounting for depreciation; overhead construction costs; contributions in aid of construction; distribution of costs of abandoned and dedicated roads and trails; accounting for temporary installations; pay roll records; refunding and payment of interest on meter deposits; verification of cash receipts by traveling auditors and commercial office verification of machine billings.

CREDITS AND COLLECTIONS

Sponsor: CHARLES DAVIES
San Diego Gas & Electric Co.

A systematic practice of refunding residential meter deposits after one year if bills have been paid satisfactorily was reported for all companies. It was stated that the California Railroad Commission had approved informally the practice of retaining commercial deposits where the payment record was not good or the account hazardous.

No experiences were reported with the Federal Reserve Bank regulation "W" governing terms and down-payments. When accounts are charged off to bad debts, it is the practice of some companies to refer them to collection agencies or the local merchants association. In cases where cooperation between companies is requested in collecting bad accounts it was suggested that a minimum bill of $5 be established. It is the practice in all companies for a district office to report delinquent accounts and unpaid closing accounts to the head office for recommendations as to collection procedure.

A wide divergence in the use of collection letters was reported. One company sends a personal letter on all over-due closing accounts. Two companies use a series of form letters, with a maximum of four letters. Another company uses a series of notices purchased from an agency.

PUBLIC RELATIONS

Group leader: M. W. PHILLIPS
Southern California Edison Co.

Emphasis was placed on the fact that customer and public relations is a job for the entire personnel of an organization from the president to meter reader. It was agreed that there was no substitute for satisfactory personal contact in improving customer relations.

Reports were given by L. A. McArthur (Pacific P&L) and C. W. Kellogg (EEI), on customer relations and customer representative programs conducted in various sections of the country, during which trained employees call on every customer over a period of time. These plans all had local angles.

It was pointed out that rate complaints were arising due to population shifts brought on by the defense program. This was particularly true where customers moved from a metropolitan to an unincorporated area.

FINANCE

Sponsor: E. J. BECKETT
Pacific Gas and Electric Co.

Closing time difficulties under the 40-hour week have resulted in changes in collection hours in various offices. Books are generally closed at 4 p.m. Other subjects discussed included practices in handling post-dated checks, "N.S.F." checks, small overpayments by customers and checks marked "Paid in Full." Procedures differed for most of the companies represented.

Methods of handling vouchers, petty cash funds and bank deposits were reviewed. One company has a card mailed from district banks directly to the treasurer's office reporting daily deposits. One company segregates checks paid it and deposits them in the banks on which they are drawn. No set formula was reported for maintaining balances in

Edison's R. G. Kenyon (left) put a group of experts through their paces in a panel discussion. Shown are Davis M. DeBard, A. J. Bronold of Westinghouse, K. M. Ryals, S. E. Gates, A. E. Wishon, PG and E. W. C. Mullendore, Edison, was the sixth man

R. G. Kenyon and Lane Weber of Edison took part in Administrative Services talks headed by Coast Counties' L. C. Rausch

district banks, the policy apparently being to maintain a deposit of such size as would compensate the bank for handling the account.

The question of stockholder records as affected by new federal regulations relating to income taxes brought forth considerable discussion.

PERSONNEL

Group leader: E. M. HENDERSON
Pacific Gas and Electric Co.

Wage incentives, sick leave and vacation payments, effect of military activities on employment and employee training were among the subjects covered during discussions.

Results of a merit rating plan in which employees are rated for salary increases by several supervisors were reported. In any case of sales personnel, the employee reaches a maximum salary in about three years. Most companies reported a two weeks vacation with pay policy after employees had been with the company one year. Two weeks sick leave per year was also reported as standard.

For employees conscripted or enlisting in the military service, one company allows a full month's salary when the military service begins. For determining who are regular employees entitled to re-employment after completion of military service, employees are rated as regular (not temporary) after one year of service.

Some instances of loss of employees due to higher paid defense jobs were reported although no difficulty was noted in filling employment requirements.

PURCHASING AND STORES

Sponsor: WILLIAM DE WAARD
San Diego Gas & Electric Co.

Increasing difficulties in securing deliveries due to priority pinching and the necessity for complying with Preference Rating Order P-46 brought forth a variety of comment. Manufacturers and suppliers present decried the policy of some suppliers of selling out of stock without priorities. Such organizations are "selling themselves out of business," according to one supplier.

Need for strict adherence to priority regulations was emphasized and some suppliers reported that they were operating on a 100% priority basis—no priority certificate, no materials.

A definition of what constitutes a "minor improvement needed for release from serious overload and other minor additions" in the A-10 priority order was sought. Some companies interpreted this as meaning additions not costing more than $1,000 to $1,500; another as a 3-pole extension.

Possible future availability of such materials as copper, steel and aluminum was considered and the consensus was that difficulties would increase before the situation eased any.

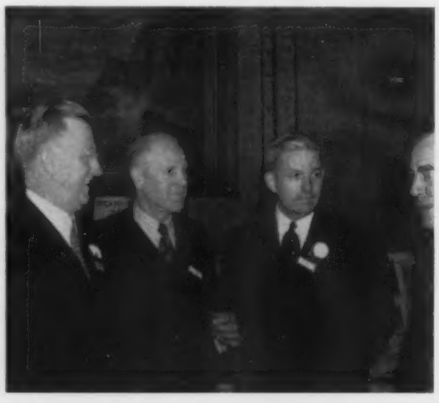
Salvage practices were reviewed with the idea of reclaiming as much material as possible for future use. Some companies are holding items heretofore scrapped for future reclamation. One company has a salvage committee which passes upon the advisability of using salvaged materials and okays the junking of obsolete items.

Business Development

LIGHTING

Sponsor: MILO CAIN
Coast Counties Gas & Electric Co.

W. H. Robinson, Jr. (General Electric Lamp Dept.), in discussing "Fluorescent Lighting in the Home", reported several manufacturers already making fluorescent lighting equipment available for kitchens and bathrooms. Montgomery-Ward features a unit at $39.95. Many manufacturers plan to make fixtures available and rapid progress is predicted in this field. He believed fluorescent offered possibilities for raising light intensity in existing homes without disturbing wiring facilities. He foresaw as much as 100 foot-candles for home



Henry C. Rice, Edison, and E. G. Stahl, PG and E, ran the Business Development Section. Stanley W. Scarfe led the Administrative Services Section

standard lighting practice. Greater use of plastics, and lighting of the entire ceiling area are possible. Portable lighting equipment with fluorescent tubes in floor lamps has not been very successful. I.E.S. has approved a study lamp, however.

R. J. Crump (Vision-Aids, Inc.) talked on the problem of "Ceiling Outlets and Ceiling Fixtures in the Home". He deplored the trend toward elimination of ceiling outlets claiming homes need general illumination as well as portable lamps. Discussion opinion was that when fixture manufacturers improve their products to warrant public acceptance, the public will purchase and install ceiling fixtures.

W. L. Duncan (General Electric Supply Corp.) explained the manufacture and uses of "plastics for light conditioning." Greater use of plastic materials because of adaptability to design and color was predicted. C. E. Kirkpatrick (Graybar Electric Co.) deplored the low quality of "portable lamp cord and switches" in portable lamps. Inferior grades, barely meeting Underwriters' Laboratories requirements, brought complaints from users and service trouble. Better cord can be used at less than 5 cents per lamp. Scarcity of materials, discussion brought out, may limit available equipment for lamp making.

Cliff Walk (Westinghouse) talking on "Selling Aids on Home Lighting," stressed the need for more dealer education. Arthur Miller (PG and E) presented a new 200-300-500-watt floor lamp that he had designed. Built without candle arms, using a newly-designed reflector bowl and deeper shade, the diffusion bowl distributes the light evenly on both ceiling and work surface. Contending the utility should constantly break trail for the industry in the use of higher levels of lighting, he pointed the advantages to a dealer in selling a high class piece of merchandise from a profit angle.

L. A. Hobbs (Smoot-Holman Co.) speaking on "Light for Production," described the three principal types of lighting in common use in defense plants—incandescent, fluorescent and mercury—discussing applications of each. Intensities of 40 to 75 foot-candles are standard practice. Lighting costs are insignificant compared to value of products. Airplane and other defense factories operate 24 hr. a day, requiring high levels in order that night shifts may maintain daytime production schedules. High mounting heights because of the size of airplanes has brought new technique.

H. B. May (General Electric) said that the FBI was receiving 200 complaints per day on sabotage and more would be received in event of war. Importance of protective lighting to industry was stressed. Each installation, he said, presents its own problems and no standard layout would apply to all plants. In addition to lighting, fences, guards and patrols are necessary for protection.

A. I. Benedict (San Diego G & E) reviewed the individual problems of each of the branches of the industry in respect to fluorescent lighting. He reported on various surveys which indicated that instead of attaining 50 foot-candles or better installations and use of the lamps for color and decorative purposes, the buying motive in 65 percent of the cases was one of cutting the light bill. The majority of inquiries today are for some form of fluorescent installation, he said. He urged presentation of complete facts with every recommendation. The trend toward higher intensities, discussion brought out, has been at a sacrifice of previous standards of quality and the whole job of quality sales has to be done over again. There was lively discussion on many phases of the application of fluorescent and incandescent lighting. As for fluorescent lighting in schools, Charles E. Gibson reported that the research department of the Los Angeles City School system had tested and abandoned it because of "too many bugs in it, design of fixtures constantly changing, excessive cost of fixtures of good design."

Charles E. Gibson as chairman of the school lighting committee, California Association of Public School Business Officials and Superintendent of Mountain View School District (his paper will be presented in full in an early issue of ELECTRICAL WEST), gave the most stimulating discussion on school lighting heard for some time.

POWER

Sponsor: P. P. PINE
San Diego Gas and Electric Co.

A symposium on power sales and national defense was conducted by the commercial and industrial power group with E. E. Peterson (PG and E) presiding. Available electric power has fixed the location of major aluminum and magnesium production but other factors govern the placing of other defense industries. All such industries require special thought and action by power

companies in cost of extending service for the duration of the emergency. C. W. Kellogg (president, Edison Electric Institute) touched on the fallacy of the politically conceived power shortage in view of existing facilities and possible emergency interchange. Thorough customer contact through the duration to meet new competitive conditions of the post-war period also were stressed.

Lew Galbraith (PG and E) spoke of the difficulty to secure correct power requirement information. R. E. Fisher (PG and E) spoke for centralized control in the utility of all military contacts with top-ranking military and naval officers. Davis M. DeBard stressed the necessity for complete understanding on agreements and contracts to prevent reactions should charges be attempted on the fold-up after the emergency.

Peterson, F. T. Schell (So. Calif. Ed.), Fisher and Kellogg all talked of possible utilization of power and industries generated by the war in post-war adjustments. Competitive sales situations not only in power and heat but in alloy products of steel, aluminum and magnesium were foreseen as possibilities for larger western industrial expansion. Frank C. Angle (Allis-Chalmers Co.) stressed the opportunity of the industry to aid industrial development during the emergency.

Because priorities and allocation of raw materials are a threat to many non-defense industries, E. G. Stahl recommended to the PCEA for study and the working out of a uniform procedure. Particularly vulnerable are many West Coast industries and especially the jobbing and distributive trade. P. P. Pine, discussing the dropping off of competitive power threats during the present emergency, warned of its recurrence on a larger scale after the war is over. Diversion of engine manufacturers to defense orders has taken the edge from this competition but post-war competition will be exceedingly severe.

WIRING

Sponsor: A. B. SMEDLEY
Anaconda Wire & Cable Co.

Value of a uniform code, expansion of it to all municipalities and unincorporated areas, and reinterpretation of the code on account of substitute materials were the three divisions of the discussion of the code and ordinance committee. Value of the code to manufacturers, contractors and distributors, utilities and inspection departments were agreed upon quite unanimously, but expansion of the code to more municipalities was still something requiring more energy and attention. A resolution was passed on to the directors to the effect that each utility member be requested to extend every effort to local and district managers to promote the adoption of this code in political subdivisions of each territory.

On interpretation of the code in view of substitute materials, suggestions were made that committees be formed to send out information to inspectors of available substitutes whose use would not lower code standards. However, this recommendation was not acted upon.

In answer to what may be expected for Red Seal adequate wiring for the next 12 months, Harry Harper (Graybar) read the OPM order No. 1122 prescribing in no uncertain terms the limitations of defense building and the complete restriction of wiring materials. Limitation also of the number of outlets per home, much below minimum requirements of the Red Seal, would make Red Seal adequate wiring go "out for the duration." Discussion of substitution of some materials brought forth a motion to appoint a committee to work with the OPM representatives in Los Angeles and San Francisco to the end that higher government standards be permitted and encouraged through the use of any available substitute wiring materials. A motion was made, likewise, that the standards for adequate wiring certification be not changed. Though no definite program was advocated, all felt that every possible effort be made to promote and talk adequate wiring so that when the emergency is over, customers will want it, having been deprived of it.

MERCHANDISING

Range, water heater and air heater group: H. H. Fogwell, Thermador Electric Co., sponsor; Clyde Allen, Graybar Electric Co., discussion leader.

Robert Downing (Valley Electrical Supply Co.) opened the discussion on "What of the Supply for 1942?" Not so much the lack of accessories on ranges being shipped now as failure of manufacturers to inform jobbers and dealers as to what has been left out was complained about. Fear that the cooker might be eliminated from ranges was expressed. Sending information to dealers and jobbers more quickly was advocated. A fair volume of ranges for 1942 was anticipated.

Arthur Miller (PG and E) opened the discussion of "Industry Sponsored Campaigns" by describing the campaign in northern California which has been a huge success. He suggested some type of promotion be put on next year to keep dealers in business. It

O. R. Doerr, PG and E general sales manager, Harvey Edmunds, Coast Counties' commercial manager talk with L. A. McArthur of Pacific P&L from Portland

was also suggested that manufacturers keep medium-priced ranges in line as far as possible in regard to priorities and curtailment. Opinion was expressed that after the emergency, the power surplus would create an ample range business.

Clifford Hayden (Coast Counties G & E) spoke of the problem of load loss in some areas due to migration of the populations to defense centers. He also stressed the need for water heater balance to load from ranges for profitable operation.

Clifford Russell (Wesix Co.) suggested "electric air heating" as a way for using surplus power in the future. He made three recommendations, one that the association issue a new air heating manual. The last one was printed in 1931. Second, that it standardize heater sizes and that it establish, third, minimum sizes.

Traffic appliance group: M. G. Seus, Leo J. Meyberg Co., Los Angeles ,sponsor; Elbert Kramer, discussion leader, Westinghouse Electric & Mfg. Co.

C. L. Moore (Chicago Flexible Shaft Co.) indicated that many changes have taken place in the kind and variety of sales outlets for appliances. Purpose of his discussion was to set the group to thinking as to the most

C. W. Kellogg, Edison Electric Institute president, was among the guest speakers

effective ways of training each type of outlet to do the maximum business.

Walter L. Stickel (Leo J. Meyberg Co.) declared that in these trying defense days, the manufacturer's salesman becomes a merchandising counsellor for his jobber as well as the dealer. The need to help dealers with overall operations such as credit and financing was discussed. Retail salesmen will have to be more flexible, learn to sell kindred lines in order to make a living. Following this, a discussion was had relative to setting up a sales training course for the salesmen of utilities, distributors and dealers similar to one conducted by the Southern California Edison Co. in 1934. A recommendation was made that rather than have a course of that kind sponsored by the utility, the PCEA in collaboration with educational organizations in the geographic location sponsor such a course. A resolution was passed on to the directors that such a course be started.

W. I. Powell (Westinghouse Electric Supply Co.) pointed out the need for kindred lines to assure a dealer of profitable operation. This would stimulate the manufacturers who, until now, had concentrated on a few lines, possibly to expand in other lines using materials of less critical defense priorities. The specialty dealers, 22.4 percent of the total, and contractor dealers, 23.9 percent of the total, need assistance more than department stores, furniture stores and hardware stores which already have kindred lines. He declared that manufacturers' salesmen and distributor-salesmen should encourage dealers to take on kindred lines, even though they do not themselves handle them, in order to keep them in business.

Kenneth Hampton (Valley Electric Supply Co.) stressed the necessity for dealers to make a profit out of service if they are to do it. From a utility standpoint, appliances remaining on shelves for lack of repair, reduce company returns and break down industry goodwill. As to who will contact these users, it was brought out that many classes of dealers such as department store, furniture and jewelry stores, do little or no service. Many utilities have felt it necessary to do a great deal. Specialty dealers, who have done it as a part of customer contact at somewhat of a loss, are now required to get a profit from it if they are to keep in business. Finding trained men and likewise getting replacement parts are also difficulties which the defense program has accentuated. A number of those present were of the opinion that utilities could devote more specialized attention to the matter of service.

Operating Economics

ACCIDENT PREVENTION

Group leader: J. M. BUSWELL
Pacific Gas and Electric Co.

Alternative methods of resuscitation to the Schafer system were demonstrated at a joint session of the hydro generation, transmission and distribution, substation and meter groups. A Fresno division line crew under Foreman R. R. McCamish demonstrated pole-top resuscitation—tying and lowering the victim from a pole erected in the hotel lobby, and continuing with the Schafer method on the ground.

The Larsen prone pressure method was explained and demonstrated as an effective substitute when a victim has serious injuries of lower back or pelvis. Points stressed were: (1) immediate application of artificial resuscitation in order to dissipate muscle spasm and build "tonic action" into voluntary breathing; (2) the pole-top method can be a "life-saver" in cramped spaces or on a pole top; (3) stimulating inhalants should be administered; (4) blood circulation is of great importance; and (5) adrenalin and other drugs are of little value.

That a dependable device is greatly needed for determining whether a line is live or dead, both for high voltages and for 2 and 4-kv. lines was the conclusion resulting from discussion and demonstration of live line detectors conducted under the direction of Roy Stewart (P G and E).

Because good leather is becoming scarce and since leather does not tolerate tests permissible with fabrics, C. A. Fischback (So. Calif. Ed.) urged general adoption of a fabric safety belt, a step already taken by the Edison company.

That motion picture films, colored slides and strip films with phonograph records can be used effectively in safety educational work was the contention of E. C. Hunt (PG and E) as the result of recent activities of his company. These may be used for both employee and public showing.

Whether 2 and 4-kv. circuits should be worked hot evoked much discussion. It was agreed that on heavy conductors and on many multiple circuit poles work with hot sticks was hazardous. However, cases were cited such as cutting over a final jumper or tap to energize a new section of line, where hot line tools could be used in place of rubber equipment.

Because of the increasing use of unfired pressure vessels such as air, fuel and other hydro-pneumatic tanks (sometimes in violation of State Safety Orders) it was recommended that companies conduct surveys to determine the location of such equipment and that a regular system of inspection and testing be devised to cover them. Closer adherence to safety practices in handling the smaller quantities of explosives used occasionally in line construction work, road repairs and small excavations was recommended.

HYDRO GENERATION

Group leader: G. R. WOODMAN
Southern California dison Co.

Close relationship between speed control and time regulation was emphasized in a discussion on "Necessity for Speed-Time Control in Hydro Plants" led by A. H. Hastings (So. Calif. Ed.) Because of system characteristics the present frequency regulation of 1/20 cycle, plus or minus, appears to be the practical limit.

B. F. Cutter (So. Calif. Ed.) outlined the exacting standards of performance and maintenance for governors before he presented methods and equipment used to analyze governor operation. The use of a strip chart recording analyzer will show immediately when a governor that is otherwise in perfect mechanical condition, does not regulate well because of too great a time lag between a speed change and resultant gate movement. Oscillographs accomplish the same purpose but the time required to develop the films is a disadvantage.

Disintegration of concrete subjected to aggressive water conditions is far from correction according to W. L. Chadwick (So. Calif. Ed.) Many waterproofing materials, such as hot and cold asphalts, coal tars, synthetic resins, paints and reinforced gunite, have been used from time to time with varying results. Chadwick suggested that some of the newer plastics might be effective. To date gunite applications, while not completely waterproof, have shown the best results.

J. H. Van Meter (PG and E) led a discussion on prevention of corrosion and cavitation, which brought out the advantages of various protective coatings which resist abrasion and chemical action. At inaccessible locations, nitrogen gas in trade pressure cylinders has been successfully used for sand blasting and paint spraying. In hydraulic turbine repairs stainless steel has shown marked resistance to cavitation.

Operating Economics Section was ably directed by H. H. Buell, PG and E, and Harry Lott of the Edison company

METERS

Group leader: F. A. REDDING
Southern California Edison Co.

Fulll cooperation of the meter group of the PCEA with the EEI national meter and service committee was stressed by W. N. Lindblad (PG and E) who is the PCEA sectional correspondent. F. E. Davis, national chairman, requested cooperation on the following:

1. Standardization of current transformers for primary circuits, including dimensions and current and voltage impulse ratings.
2. Service cable standardization involving a study of available service entrance and service drop cables, tests of which are now being conducted by the Underwriter Laboratories.
3. Standardization of demand register scales, a move toward the elimination of many of the scales now in use.
4. Thermal demand meter rating and scales with an effort being made toward simplification.
5. Cumulative demand registers, an effort being made to determine the trend toward greater use of this device.

Effects of the defense program were emphasized by W. H. Talbot (San Diego G&E), especially the difficulties of procurement and the problems related to substitution of materials due to shortages. H. D. Noren (Coast Counties G&E) led a discussion on socket meter practice and K. M. Stevens (So. Calif. Ed.) presented a progress report on tests of 5-amp. vs. 15-amp. meters as a standard for residential loads where no major appliances are installed.

STEAM GENERATION

Group leader:: V. F. ESTCOURT
Pacific Gas and Electric Co.

During certain seasons of the year when no natural gas is available for pilot firing, it has been necessary to use fuel oil for this purpose and this has resulted in the development of new burners and new techniques according to F. G. Philo (So. Calif. Ed.) Considerable study has been made of special pilot oil burners capable of being operated at high capacities.

He pointed out that neither non-return nor standard return type mechanical atomizing burners have sufficient operating range for this purpose. Recent improvements in the latter type burner depend upon a closely adjusted air supply not available with boilers of high capacity having forced and induced draft fans. Experiments are under way with a modified return type burner that gives a candle-like flame of high stability at extremely light loads.

Desire to reduce the "cost per kilowatt" has focused attention on equipment designed for outdoor service in the opinion of E. C. Blodgett (General Electric) who called attention to successful practices in oil refineries. An outdoor plant has been operating successfully at Schenectady for eight years with temperatures as low as 20 deg. below zero. Two plants in southern California designed for outdoor operation have been "dressed up" until only the turbines and generators are outside and recently a housing has been built over one main turbine. Discussion brought out that outdoor overhaul of the main turbine would present some difficulties.

Only minor difficulties were experienced in starting operations of the PG and E Avon and Martinez steam plants according to E. G. Gothberg (PG and E). Early troubles with steam temperature regulation were overcome by a change in airflow measurement. Major operating problem was the training of personnel for these steam plants. Men were hired well in advance of completion of the plants and were assigned to either Station A or Station C for training. A nucleus of experienced operators was also transferred from these older plants.

Dvelopments in turbine lubrication were reviewed by Alf Hansen (PG and E) who called attention to the use of rust inhibitors in highly refined oils. Although low neutralization numbers may be maintained by the use of activated alumina, Hansen emphasized that this would result in removal of the rust inhibitors.

Among the protective coatings now being used in PG and E plants, A. K. Ingraham (PG and E) called attention to the following: Lead spray as a coating on heat exchanger water boxes; cement lined pipe for salt water piping; rubber lined pipe for sulphuric acid in water treating equipment; glass lined valves for piping carrying acid sludge; asbestos-asphalt lining with a 4-in. layer of gunite in smoke stacks where exit gases are highly corrosive. Discussion brought out that special heat and corrosion resistant enamels are being successfully applied to pipes and tanks. One plant has under consideration an enamel coating for a large circulating water pump runner, thus permitting the substitutiion of cast iron for bronze, with the hope of obtaining an even longer life than bronze gives.

ROEBLING *Looks Ahead*

TO A SECOND CENTURY OF PIONEERING!

The past—despite its achievement—is *behind*. The opportunity to continue to grow, to further achieve, to serve industry in even greater measure, is *in the future*.

» » That is why Roebling—at the celebration of its 100th Anniversary—LOOKS AHEAD—looks ahead with confidence to new opportunities to Pioneer in Wire—new opportunities to develop the finest wire and wire products that aggressive research, unequalled experience, and the most modern of manufacturing facilities can make possible.

ROEBLING ELECTRICAL WIRES AND CABLES

JOHN A. ROEBLING'S SONS COMPANY

SUBSTATIONS

Group leader: R. D. LIKELY
Pacific Gas and Electric

Contrasting package substations and load center units, M. S. Barnes (General Electric) presented data to show the increasing popularity of this type of equipment. He defined a package substation as a transformer with tap changing under load and switches for usually only one outgoing and one incoming line. Load center unit applies to similar equipment except that the secondary voltage is 600 or less and the application is usually confined to industrial plants.

General opinion was that outside of metropolitan areas, the conventional substation can compete economically with the package unit and has some advantages, particularly where more than one outgoing or incoming line is required. Curves were shown that indicated that the most economical size of load center unit was between 600 and 1,000 kva. It was stated that in some instances secondary networks with networks protectors could be justified. An example was shown where use of load center units showed a saving of 17% over conventional methods.

Past President C. E. Houston of Edison listens to C. W. Hicks of Hawaiian Elec.

Marked increase in interest in portable substations was noted by J. V. Kresser (Westinghouse) who stated that one such unit rated at 2,500-kva. has been purchased for the San Francisco Bay area. Major use is in case of accidents or during maintenance of stations having no spare transformer. Majority opinion was that portable spare transformers could not be justified from a cost standpoint.

Citing the absence of oil indoors as one of the principal advantages, Alex Fulton (General Electric) reviewed air blast circuit breaker developments. They are well suited to ultra-high speed reclosing and to applications requiring a large number of operations he said.

Permissible operating temperatures of electrical apparatus with special reference to transformers was reviewed by H. H. Minor (PG and E) and W. C. Smith (General Electric). It was pointed out that using up the life of a transformer was similar to wearing out an automobile tire; with moderate speeds and careful braking a greater mileage can be obtained than with higher speeds. Indicative of the effect of various loads an example was cited where two banks of transformers equal in size, were loaded to their combined rating. If one bank was to be taken out of service for four hours and the remaining bank carry the total load (double its rating), its usefulness would be reduced one per cent.

H. G. Keesling (PG and E) brought out that one of two California utilities has a plant for treating sludged transformer oil and the second has its oil treated by an outside firm under contract. In both instances costs are approximately 6 cents per gal. C. Lynn (Westinghouse) outlined procedures for handling equipment using non-inflammable liquids (pyranol and inerteen). Persons susceptible to skin irritations should cover hands and face with a protective coating of oil, he said, and more care was needed in cleaning cases because these liquids dissolve grease and rust. P. P. Nevin (So. Calif. Ed.) called attention to difficulties in handling hydrogen-filled equipment. Two cases were cited where brush wear caused carbon dust which produced flashovers. The possibility of obtaining increased capacity by using pressure up to 15 lb. gage was mentioned, the increase being about 20% as compared with operation at pressures of 1 to 2 lb. gage.

TRANSMISSION AND DISTRIBUTION

Group leader: E. M. WRIGHT
Pacific Gas and Electric Co.

That the cost of cleaning insulators on hot lines is slightly more than in the case where lines are de-energized but that benefits from keeping the line in service outweigh the cost differential was the consensus of a discussion led by J. A. Mulkey (PG and E). Various tools for wiping hot insulators were demonstrated, including a new design for cleaning suspension type insulators in which a metal mesh can be inserted for removing scum.

Hot cleaning is confined to 11 and 60-kv. circuits in Edison territory. This company has developed a light weight stick with a rubbr tip for cleaning pin type insulators so that linemen do not become fatigued as quickly. A special burlap is used for wiping grime or encrusted dirt off the insulators and in some instances this is dipped in solvents. This practice is confined only to insulators on wood poles.

Several companies had installed equipment at substations for washing insulators on the bus, but it has been found that this only cleans the top and that periodic wiping is necessary. The thought was expressed that more consideration be given to clearance in substation design so that insulators might be more readily wiped hot.

Southern California Edison's method of soil analysis to determine the corrosive effect of soil on steel tower footings was described by C. T. Malloy (So. Calif. Ed). From tests and experience Edison has concluded that the life of concrete foundations is much greater than any specially protected steel footing. Other types of steel footing protection used by Edison include zinc rods buried near steel footings and electrically connected to them; bitumastic paint; four coats of enamel brushed on; hot-dip enamel coating and concrete encasement of footing members.

In substituting for critical defense materials in line construction, length of life rather than quality should be sacrified in the opinion of F. B. Doolittle (So. Calif. Ed.) who led a discussion on this subject. Difficulty is being experienced in securing creosote and several substitutes are being tried. It may be necessary to come ultimately to salt. Several companies have changed their specifications for cross arms. Wood braces in place of steel for cross arms were suggested. It was proposed that where larger sized copper than is necessary is installed on a line, this might be replaced with lighter copper and the larger used where needed. It was suggested that construction standards be reviewed for possible modifications and that more attention be given to possible salvage.

Increasing use of non-leaded cables for underground service was reported by L. E. Wolbert (PG and E), both buried directly in the ground and in ducts. It was the general opinion that the cost of terminating non-leaded cables on poles, transformers and in junction boxes is less than for lead-covered cable; but that splicing costs are higher where the cable is shielded.

The suggestion that 3-phase motors used in rural areas should have three-element protection was advanced by W. L. Hill (PG and E) in a discussion of protection against single-phase operation. Many motor burnouts have occurred on farm pumping plant installations where motors were not properly protected or where energy supply changed over to single phase. In most instances the fault was with the customer's installation but it was reported that it is difficult to convince the customer that the utility is not at fault.

Discrepancies in the new EEI-NEMA transformer standards and the requirements of General Order 64-A of the California Railroad Commission were brought out by Paul Suransky (PG and E). Differences are in the adoption of the standard "T" hangers and the bolting of single-phase transformers directly to the pole. Opinion was that the California requirements should be modified to meet the national standards. C. E. Baugh (PG and E) in discussing distribution line investment costs reviewed the changes in G.O. 64-A that will make cost reductions possible.

Automatic switching equipment is available for putting capacitors on and off the line in order to maintain proper voltage regulation according to H. H. Minor (PG and E). Need for this has not yet developed on California systems although these are cases where it might be desirable on 2.3 and 4-kv. lines. One company reported that it had installed shunt capacitors on the secondary side of transformers with no resulting operating difficulties.

TRANSPORTATION

Group leader: W. H. BROWN
Southern California Edison Co.

Advances in automotive design and engineering have eliminated some problems of servicing and maintenance but at the same time have created new situations in the opinion of S. B. Shaw (PG and E). This is especially true in the field of lubrication. Various compound oils affect metal surfaces differently, he pointed out.

C. J. Kline (PG and E) reviewed the subject of preventive maintenance and reported on a system of periodic inspection for both company and personally-owned vehicles used in company service. F. G. Strain (PG and E) reported on motor servicing and recommended a standard practice of 1,000-mile passenger car chassis lubrication and 800-mile truck chassis lubrication.

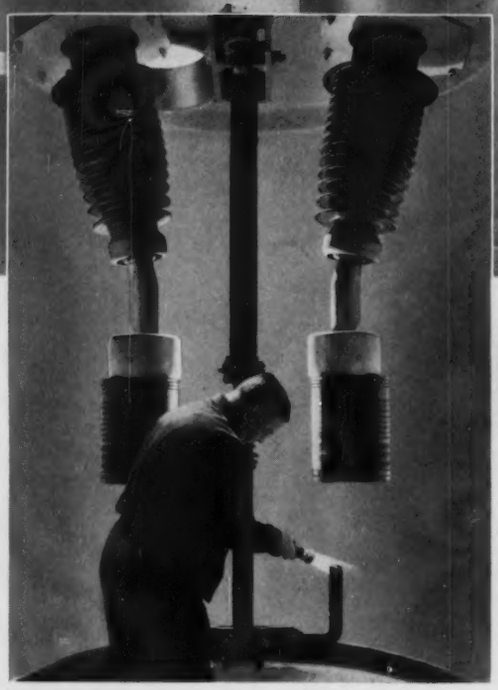
An all purpose transmission and differential lubricant is being developed for the U. S. Army and it will save utilities considerable time and money according to C. R. Stanley (PG and E). Diifficulties encountered in correcting low water-jacket temperatures on trucks operating at night were discussed. Sale of gasoline and oil to employees using their cars for company business has a bad effect on relations with service station operators according to M. D. Tubbs (So. Calif. Ed.)

H. Bickle (PG and E) emphasized the importance of salvaging and conserving parts due to the defense program. Experiences in reclaiming parts by metal spraying, brazing and welding were reported, and an extension of this practice urged.

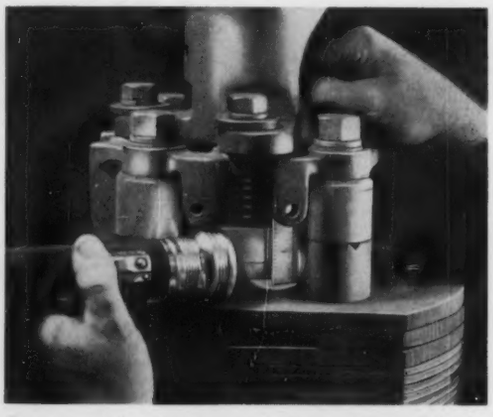
ONE BIG REASON

Why MAINTENANCE MEN PREFER...

WESTINGHOUSE OIL CIRCUIT BREAKERS



Moving contacts on all types of Westinghouse Oil Circuit Breakers are accessible in open position.



Two types of stationary contacts may be used. Butt-type contacts may be inspected without removing grids. An aluminum static shield must be slipped off first. Finger-type contacts are exposed by loosening three bolts and removing the arcing horn.

CONTACTS CAN BE INSPECTED WITHOUT DISASSEMBLY

On ALL Westinghouse Oil Circuit Breakers, periodic inspection of contacts can be made in only a few minutes working time after oil is removed or tank dropped. No time-consuming disassembly is necessary. It is only necessary to close breaker manually, or to remove three bolts, to get full information on the condition of the contacts.

Should the contacts need dressing—seldom, with "De-ion Grids"—the entire grid can be dropped off by removing four bolts. No other work is necessary.

Faster maintenance saves labor—more important, gets equipment back in service with less time out. This is only one of many reasons why Westinghouse Oil Circuit Breakers are being ordered in such large numbers.

J-60484

Westinghouse

OIL CIRCUIT BREAKERS

RELATED PROTECTION . . . FROM

3 Reasons

1

A BUSHING WITHOUT GASKETS

Sealing—without gaskets—has been one of the ultimate aims in Bushing Design since Westinghouse announced the Type A in 1909.

Now Solder-Sealing eliminates gaskets, the biggest source of bushing maintenance. It adds a 3rd and absolute defense against moisture in all ratings 15 through 69 kv. Waterproof plastic and special oil-and-varnish treatment, standard since 1937, are still retained.

NEW BUSHING MANUAL

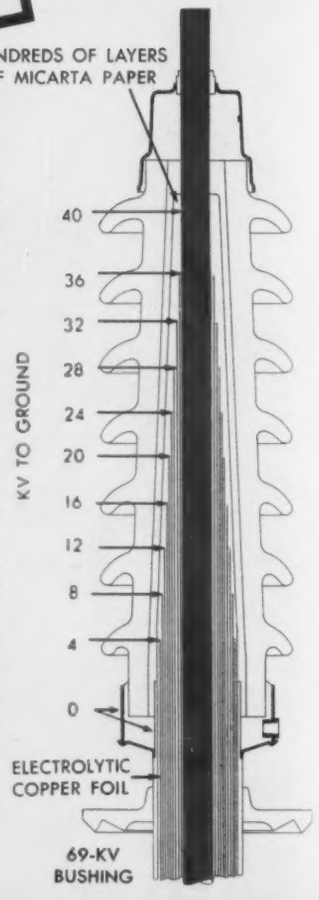
Contains basic principles of Condenser Bushing design and identifying information for Condenser Bushings from Type A developed in 1909 to the 1941 Type S. Ask your Westinghouse representative for a copy or write Dept. 7-N, Westinghouse, East Pittsburgh, Pa.

12 TO 1 ELECTRICAL FACTOR OF SAFETY

Condenser, not porcelain, provides the insulation. Design permits scientific control of voltage gradient without auxiliary shields.

Radial (puncturing) voltage gradient: uniform, with maximum well under 40 kv per inch. Ratio of one-minute strength of bushings, in puncture, to normal operating voltage to ground, is in order of 12 to 1.

Longitudinal (flashover) voltage gradient: uniform, with maximum under 2 kv per inch—well below minimum breakdown for air or plastic. Because of the low voltage gradient, these bushings have negligible radio influence.



Solder-Sealing

Gold-platinum compound, mixed in glaze, is painted on porcelain.

Baking makes metallic compound an integral part of porcelain.

Metallic bands are tinned, preparatory to soldering.

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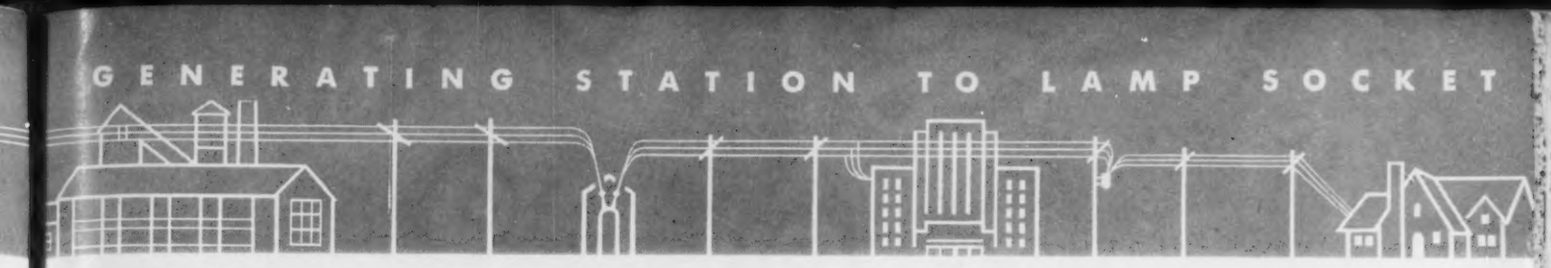
WESTINGHOUSE

Westinghouse



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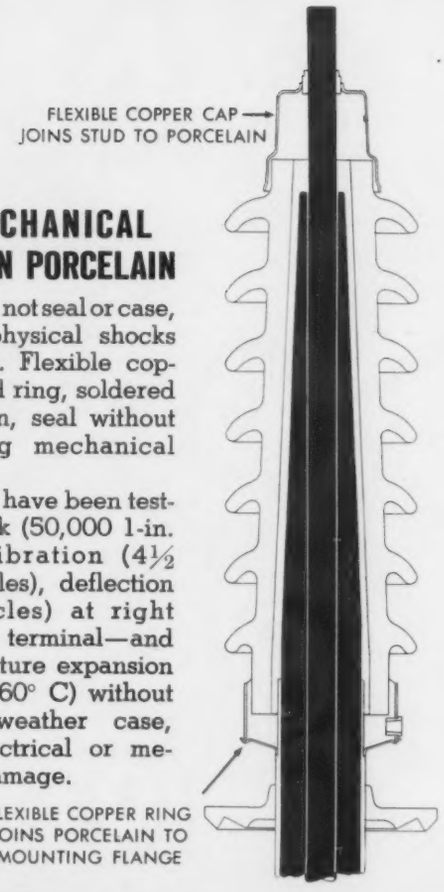


NO MECHANICAL STRAIN ON PORCELAIN

Condenser, not seal or case, takes all physical shocks and strains. Flexible copper cap and ring, soldered to porcelain, seal without transmitting mechanical forces.

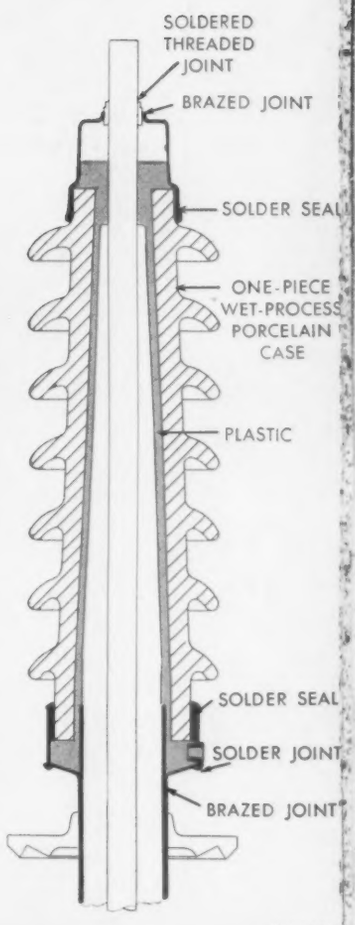
Bushings have been tested for shock (50,000 1-in. drops), vibration (4½ million cycles), deflection (5400 cycles) at right angles to terminal—and for temperature expansion (dry ice to 60° C) without leaks in weather case, without electrical or mechanical damage.

3 DEFENSE LINES AGAINST MOISTURE

Condenser is waterproofed by special oil and varnish treatment. (Test unit operated satisfactorily after 1500 hours under water.)

Plastic filler, between condenser and porcelain, is heavier than water, will not mix. (Test units, open to weather have not changed power factor after 4 years at 50% overvoltage.)

Bushings (15 through 69 kv) now hermetically sealed in porcelain weather case—vacuum tight and permanent. Solder-Seal eliminates gaskets.



J-90450

Copper cap is soldered to top of porcelain, ring to bottom.

Solder-Sealed porcelain is given underwater air test at 80 pounds.

Porcelain, with cap and ring attached, is assembled on condenser unit. Upper end is soldered to terminal stud, lower end to mounting flange. Plastic filler is forced in; filling and breather holes soldered shut. Solder-Seal is stronger than porcelain, as permanent as any soldered metal joint.

CONDENSER BUSHINGS

The "De-ion Grid" for oil circuit breakers

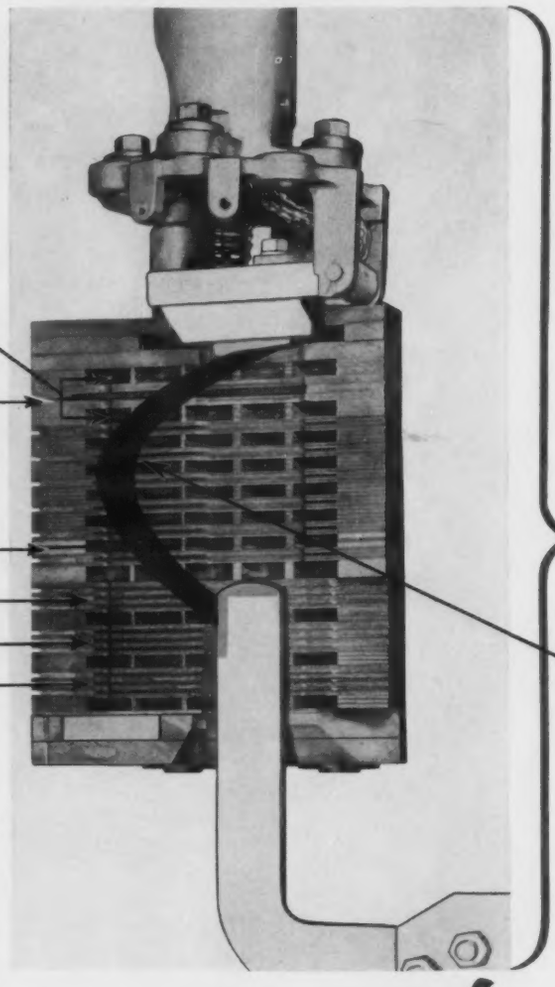
Cross section of typical "De-ion Grid" as used with butt-type contacts (115-kv and above).

Butt-type moving and stationary contacts are faced with arc-resisting tungsten alloy. Spring at top maintains high contact pressure; shunt carries current from main contact to bushing stud.

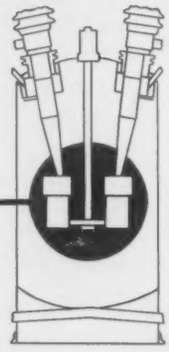
Oil trapped in pockets provides a multitude of sources of fresh un-ionized gas.

Vents direct blast of gas for most efficient de-ionization of arc path.

Insulated iron plates form magnetic circuits that control arc, drive it into contact with fresh oil and lengthen its path.



"De-ion Grids" so radically changed old conceptions of oil circuit breaker design that application standards were raised, duty cycles increased in severity. "De-ion Grids" not only lengthen the arc and cool it; they also remove ionized gases from the arc path. Drawing at left shows how this is accomplished.



Arc, drawn within "De-ion Grid," is forced into intimate contact with oil. Continuous supply of relatively cool, un-ionized gas blasts through arc space, cools it and drives out conducting ionized gas particles. Arc is interrupted in a fraction of the time required by plain break in oil.

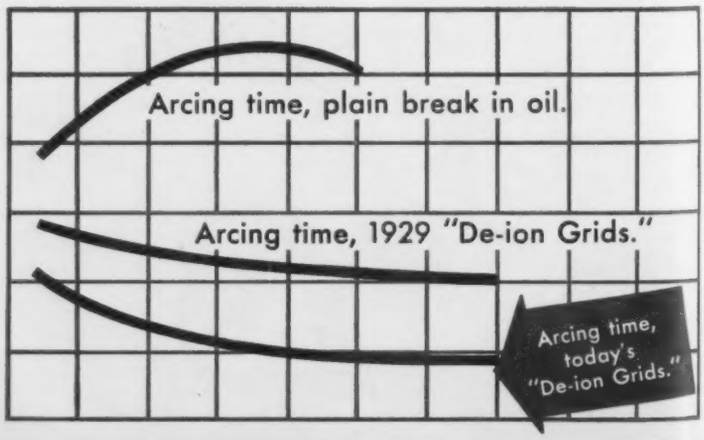
Fast in 1929 even faster Today!

In 1929, the "De-ion Grid" was first introduced on Westinghouse Oil Circuit Breakers. It was revolutionary. Its much faster arc extinction brought about tremendous improvements in circuit-breaker practice.

The "De-ion Grid" has been improved, continually, during the 12 intervening years. Changes in oil pockets, in venting, in magnetic circuits have cut arcing time even further.

Today's "De-ion Grids," installed on older Westinghouse breakers, or as equipment on new breakers, will reduce system disturbance, reduce maintenance. Write Westinghouse, Dept. 7-N, East Pittsburgh, Pa., for complete information.

J-60483



Westinghouse

OIL CIRCUIT BREAKERS

NEWS of the industry

POWER BONDS DEFEATED---S. F. SEEKS RAKER ACT CHANGE

Following the eighth defeat of a bond measure to put San Francisco into the municipal power business by an official vote of 114,879 to 67,214 last month (see page 27) the city administration began a campaign for amendment of the 28-year old Raker Act. Appointment of an executive committee to head a citizens' delegation to Washington in an endeavor to convince Congress that the city should have the right to sell its Hetch Hetchy power to a private utility was the first step. Passage of a resolution calling upon the two California Senators and the city's two Congressmen to introduce such an amendment was the second.

In the meantime Thomas Rolph, San Francisco member of the House of Representatives, had introduced such an amendment in the House, calling attention to the overwhelming defeat of the $66,500,000 bond issue. At the same time he introduced a resolution authorizing the postponement for three years of a Supreme Court decision upholding the validity of the Raker Act and enjoining the city from continuing its agency agreement with the Pacific Gas and Electric Co. for disposal of the power. The injunction's effective date had been postponed until July 1, 1942.

California's Governor Olson, who had taken a personal part in the November city election by actively supporting the bond issue, announced that he had invited the Congressional subcommittee, which will pass upon the proposed amendment, to visit California to hear protests against it. Governor Olson, a strong municipal ownership advocate, has been active in the Hetch Hetchy controversy since his election.

New PGE-Bonneville Contract Negotiations Approach Impasse

With the approach of the expiration date, Dec. 1, of Portland General Electric Co.'s contract with the Bonneville Power Administration for the purchase of Bonneville power, negotiations for a new contract are rapidly coming to a head. Terms of this contract are said to include a provision that the company shall sell its Clark County, Wash., and Woodburn, Ore., properties to the Clark County PUD and Woodburn municipality respectively at a price stipulated by Paul J. Raver, Bonneville Administrator, acting as negotiator. In addition, Dr. Raver stipulates that if the company is to get a long-term contract, it shall agree to the price at which the balance of its property can be purchased in its entirety, presumably dependent upon passage of federal legislation permitting such purchase.

In the same breath Dr. Raver has announced that in the event a new contract is not negotiated he will not cut off the company's Bonneville supply but will continue to serve its peaking requiremnts over and above what the company cannot generate in its own steam and hydro plants.

The company points to the coercive nature of these terms, stating that legal processes now exist through the courts if necessary for both Clark County and Woodburn to acquire the company's distribution systems in those places. The company states that since its Bonneville contract went into effect Dec. 1, 1939, it has made rate reductions amounting to upward of $1,750,000 in anticipation that it would continue to be able to purchase a substantial quantity of Bonneville power to supply a part of its base load. If the company must now carry all its base load on its own generating plants, requiring the burning of oil for part of the year, its cost will be increased by approximately $400,000 per year.

The company's contract with Bonneville, which was effective Dec. 1, 1939, for one year with a renewal for a second year, calls for the purchase of 20,000 kw. firm and an undetermined quantity of dump power as such might be required and as Bonneville could supply it. In the first eight months of this year, the company's maximum demand on the Bonneville system was 59,500 kw.

- VOTERS of Springfield, Ore., rejected 645 to 412, a $200,000 bond issue for the acquisition of either a power or water system or both in the Nov. 4 election. This was the fifth time public ownership agitators had forced elections.

- ENTRY into the municipal power business will be voted upon in Yuma, Ariz., on Dec. 9 when citizens will pass upon a $900,000 revenue bond issue. Yuma is served by the Arizona Edison Co. and the California Electric Power Co.

- AWARDS totaling $3,000,000 have been made for the 40-circuit mile, 230-kv. line from Boulder Dam to the Basic Magnesium, Inc., plant near Las Vegas, Nev.

NORTHWEST POWER POOL VITAL TO NATIONAL DEFENSE---McKEE

Emphasis was placed upon a continuing policy of pooling of power resources in the Pacific Northwest to meet defense power requirements by Paul B. McKee, president of Pacific Power & Light Co., in a recent statement to stockholders. Repeating an earlier statement, McKee said:

"With the demand for power throughout the Pacific Northwest sharply stimulated by direct and indirect defense activities, the company is closely coordinating its operations with those of the utility systems with which it is interconnected, to the end that maximum use of all facilities be achieved in the common cause of national defense. Further strengthening of the power resources of the region can result from a pooling of both public and private facilities during the emergency, and on its part the company is preparing plans to build interconnections to be available for the interchange of power with the Bonneville-Grand Coulee system at Hanford, Union Gap and Walla Walla, Wash.

"The seriousness of the need for extraordinary production on the part of many different industries and groups is becoming more and more apparent, and the situation naturally places new and urgent responsibilities upon the members of the company's operating organization. Every possible effort is being made to meet these responsibilities promptly and efficiently."

Despite recurring threats of governmental taking over all or parts of the company's territory and other uncertainties, McKee declares that the 730 men and women of the operating organization are continuing their best efforts to maintain outstanding service to the 72,929 customers. "That will remain their determined purpose," he said, "and we believe their accomplishments are being recognized and appreciated by our customers and the public generally. We believe our customers are coming to recognize that the development of a policy of businesslike and reasonable cooperation between regulated private enterprise and those in charge of the federal projects would enable us to supply our customers on terms as favorable as those suggested as 'objectives' by the Bonneville Administration, without unloading on worried and already heavily burdened home owners and taxpayers any of the general tax burdens now carried by the company's operations."

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EDISON CONSTRUCTION TO TIE IN MORE BOULDER POWER

The Southern California Edison Co. is entering the final stages of an important construction program which will make available an additional 82,500 kw. of Boulder Dam power and tie in Boulder Dam more closely with its major transmission system, providing additional energy and more reliable service for southern California's rapidly expanding centers of industry and population.

Totaling approximately $6,500,000. the construction program has four phases:

(1) The most important is the construction of the Edison Company's second 220-kv. line from Boulder Dam to its receiving station at Chino. This 233-mile line, paralleling in general the company's first line from the dam, will be completed and in operation before the end of 1941. A cross-over station at Pisgah is a part of the project.

(2) The Edison Company is extending its 220-kv. transmission line from Chino to its Laguna Bell substation near Maywood. This work will be completed some time in March, 1942.

(3) In operation since August, 1941, is the new 220-kv. line built from Edison's Barre substation near Stanton, in Orange County, to its Lighthipe substation in North Long Beach. The 220-kv. line from Chino to Barre was built in 1939 as a part of the first Boulder line project.

(4) Installation of Edison's third 82,500-kw. generator at Boulder Dam is expected to be finished by July, 1942.

Details on the new Barre-Lighthipe line are as follows:

The line has a carrying capacity of 200,000 kva. It is 15.8 miles in length. Double circuit steel towers are used, similar to those on Edison's Lighthipe-La Fresa 220-kv. line. Total height of the towers is 138 ft. 8 in. In two locations where special clearances are required, 16 to 48 ft. extensions are used. Height from the ground to the bottom arm is 92 ft. Base dimensions are 24x24 ft.

Conductors are ACSR, size 605,000 circ. mils, with 54 strands of aluminum and 7 strands of steel reinforcing. Conductors are arranged vertically, in single circuit, with provision for a future circuit. One overhead ground wire is used of ½-in. Siemens-Martin steel, medium strength. Suspension insulators are of the fog type, 14 per string. Dead-end insulators are of standard type, 15 per string. Vibration dampeners are of the Stockbridge type.

Eleven miles of the line has foundations of wood piles. Cast-in-place concrete piles similar to those being used on the Edison Company's Boulder line are used for 4.8 miles of the line. Relay protection consists of carrier current pilot protection in conjunction with carrier current telephone.

Special construction features of the line include the pile foundations and the re-location of 9 towers (1.4 miles) of Los Angeles Bureau of Power & Light 115-kv. line to avoid two cross-overs.

At Barre substation new 220-kv. buses and racks of the four circuit ring type were installed, as were three 220-kv. oil circuit breakers transferred from Gould substation and new carrier current relay equipment.

Equipment changes made at Lighthipe substation included new carrier current relay equipment, rearrangement of the 220-kv. rack and installation of a 220-kv. oil circuit breaker transferred from Saugus substation.

G-E Head Urges Post-War Labor, Industry and Farm Cooperation

Stuart M. Crocker, General Electric vice-president, speaking before three different groups on his recent trip to the Pacific Coast, advocated immediate planning by industry, labor and agriculture for a post-war program of cooperation, if the American institution of freedom, initiative, competition and individual enterprise are to survive.

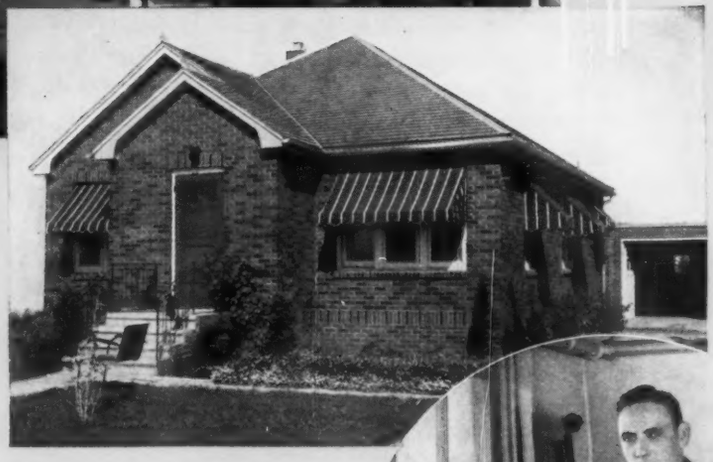
To the California State Chamber of Commerce at Oakland, he said that the post war program must be worked out by industry itself—"by management, labor and all who contribute to and derive from industry. Industry must take the initiative, for what is coming will be unparalleled in our history. We face either the greatest period of constructive development of all time or the greatest disaster."

To the Los Angeles Electric Club he described how General Electric's production had shifted from peacetime to war-time products, its capacity and man power increased tremendously. "Can General Electric still employ these men when the war ends? Other companies are asking the same question. The only way is to find new markets and extend old ones . . . It is the only solution to widespread unemployment."

At the annual convention of the California Farm Bureau Federation at San Jose, Crocker emphasized that government cannot do the job of re-orienting the country to peacetime activities without the danger of destroying American democratic institutions.

● DOUBLING of the capacity of the electrically operated magnesium plant of the Kaiser interests at Permanente, Calif., has been announced. Ultimate load will be 100,000 kw.

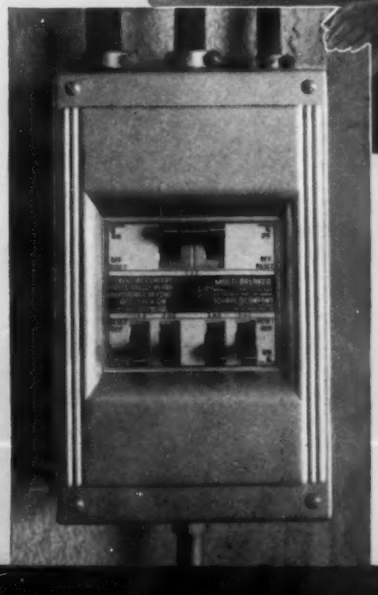
OGLESBY HAS 900 HOMES—
325 ELECTRIC RANGE INSTALLATIONS—
AND 300 SQUARE D MULTI-BREAKERS



HERE'S still more proof of a potent fact—when people know about the Multi-breaker, how it eliminates fuses completely and how little it costs, they choose it in preference to ordinary switch and fuse equipment. In the vast majority of cases, they don't have to be *sold*—simply *told*.

In the case of Oglesby, it isn't only the home owners who are quick to see Multi-breaker advantages. Superintendent Moliske, thinking in terms of dependable service and consumer good-will, endorses and encourages Multi-breaker installations.

Above—A typical Oglesby home.
At right—Utility Superintendent Burkett Moliske.
Below—One of the 300 Square D Multi-breaker installations with range circuit and four lighting circuits.



There's still another angle as far as electrical contractors are concerned. The Multi-breaker paves the way for bigger and better wiring jobs—more outlets and more appliances. All of which means more profit.

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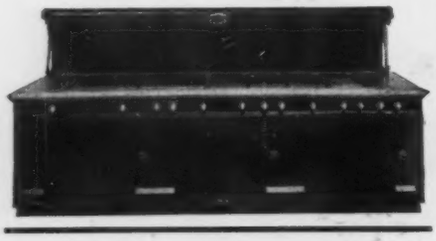

PG AND E UNION DISSOLVES AS NLRB HEARS CHARGES

Disestablishment of the California Gas and Electric Employees Association as the bargaining agency for approximately 8,500 Pacific Gas and Electric Co. employees was stipulated by company attorneys at a National Labor Relations Board hearing conducted in San Francisco last month. The hearing had been called to review a dispute between members of the CIO Utility Workers Organizing Committee and the company over what agency should represent outside workers in the company's East Bay division.

At the same time charges by the AFL International Brotherhood of Electrical Workers that PG and E had engaged in unfair labor practices were also being heard. At issue was a threatened strike in the East Bay area called by the CIO union.

The California Gas and Electric Employees Association, an independent union, was formed in 1937. In an NLRB sponsored and supervised election, the independent union won out by a large majority over the CIO union. On a complaint by the CIO that the company had interfered in the election, the labor board refused to certify the independent union as the bargaining agency and voided the election. However, the company had entered into wage and working condition agreements with the California organization and these have been in force up to the present.

Following the company's stipulation, the employees association announced its intention of disbanding to the NLRB. In case the labor board calls another election, which seems likely, this will leave the field open to the CIO and AFL.

Ickes Again Seeks Shasta Transmission Funds

Funds for initial expenditures on a 220-kv. transmission line from Shasta Dam to Antioch, Calif., several times denied by Congressional appropriations committees, are being sought again by Secretary Ickes as a defense emergency item. He has requested $3,000,000 of the estimated $23,000,000 cost of the lines.

In his letter to the appropriations committee Secretary Ickes stated that the USBR has $1,100,000 available for surveys, right-of-way purchases and other purposes, some of which is already being spent. He also dismissed as impractical a suggestion made to John C. Page, reclamation commissioner, by PG and E President J. B. Black, that transmission facilities of that utility be used for transporting the power. This offer was made last August.

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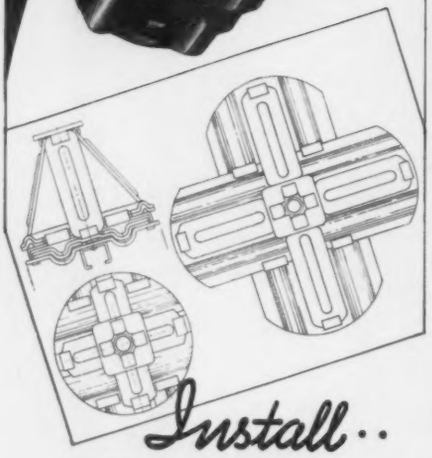

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BOULDER DAM POWER HOUSE NOW WORLD'S LARGEST

Boulder Dam power house clinched its title as the largest generating station in the world late in October when the ninth 82,500-kw. generator went into operation. It gave the station an installed capacity of 787,000 kw. including nine major units, one 40,000-kw. machine and two 4,800-kw. station service units.

The newest machine was designated as A-1 and is the third major unit to be installed in the Arizona wing of the power house. Six units are already in service in the Nevada wing. Two additional generators are being installed and funds have been asked for a third, leaving but four units—one 40,000-kw. —yet to go into the plant. Ultimate capacity will be 1,322,000 kw.

Peak loads on the plant for 1941 occurred on Sept. 22 and 23; on the former day load was 731,500 kw., on the latter, output was 13,504,000 kw.-hr.

Bonneville Asks Emergency Funds For More Construction

Request for a $30,000,000 emergency appropriation for construction of additional transmission facilities in Oregon, Washington and Idaho has been made to Congress by Bonneville Power Administrator Paul J. Raver. The request held that the lines were essential to meet industrial expansion for defense. It had the backing of both President Roosevelt and OPM Director W. S. Knudsen.

No detailed breakdown accompanied the request except for general allocations. These included $12,142,530 for transmission lines. $8,238,470 for 230-kv. substations, $2,490,000 for 115-kv. substations and $5,000,000 for feeder lines.

Prior to the $30,000,000 request, Bonneville had received approximately $62,000,000 for the construction of lines and substations making up its transmission grid.

● A $200,000 BOND ISSUE to finance expansion of the municipally-owned power and light plant at Murray, Utah, was passed by a majority of 871 to 213 on November 4. According to the city commissioners, the issue, which provides funds for building a new steam generating unit at the plant, was necessitated by a greatly increased population growth.

● BONNEVILLE POWER ADMINISTRATION has allocated $338,000 to build 38 miles of 57-kv. line from Willimina to Tillamook, Ore., to serve the Tillamook County PUD.

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To build her poor child a swing.
The grain in the board
Went crosswise—oh Lord
And junior fell down with a
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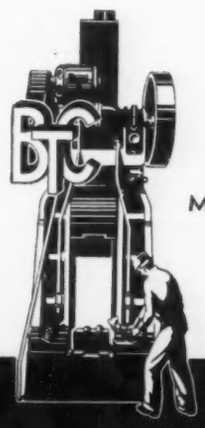

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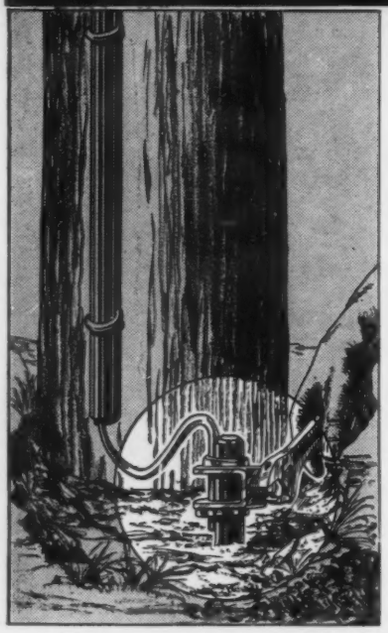

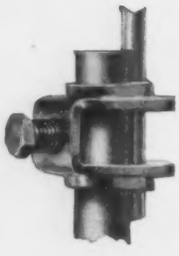

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PRIORITIES

In response to many requests, ELECTRICAL WEST will publish in this column monthly a summary of significant priority rulings and a bibliography of pertinent articles on the subject.

FURTHER INTERPRETATIONS have been issued for Priorities Order P-46, setting forth dollar definitions of the minor capital improvement clause and defining limitations on inventory and use of materials. Connections for new consumers and improvements to relieve minor overloads are limited to $1,500 for underground and $500 for other cases. Inventory is tied to system output as regards increases. Meter purchases in any one quarter are set at not to exceed 25% of all meters condemned or destroyed in 1940 plus those necessary to serve the net increase in customers. Allowances are made for purchase and use of materials to meet unavoidable emergency situations.

AN A-3 PREFERENCE rating has been given for repair materials for elevators and escalators and construction materials for conveyors in Orders P-72 and P-78.

PREFERENCE RATING ORDER P-22 covering repair, maintenance and operating supplies has been amended to include natural gas and petroleum transportation facilities, privately owned irrigation systems, and toll bridges. It also extends the assistance of that order to independent contractors and others who repair or maintain the property of producers included in the complete order.

OPM has published a 72-page handbook detailing the functions and administration of the various defense agencies within or associated with OEM. An excellent reference work, it may be obtained from the Superintendent of Documents, Government Printing Office, Washington, D.C. for 10 cents (coin only).

Bibliography:

Guidebook to Priorities — Reprint from *Business Week*, Sept. 20, 1941, obtainable from McGraw-Hill Publishing Co., 330 W. 42nd St., New York.

DEFENSE, official weekly publication of the OEM, obtainable from Superintendent of Documents, Government Printing Office, Washington, D. C. at annual subscription rate of 75 cents, payable in advance.

"Those Important P Orders," *Business Week*, Nov. 15, p. 16—A tabular summary of all priority orders.

"P-22 Amended," *Mill Supplies*, November, p. 33.

"Instructions Issued for Project Ratings," *Electrical World*, Nov. 15, p. 74.

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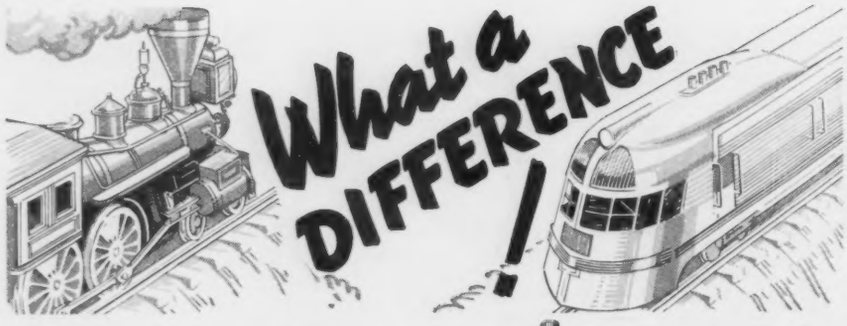

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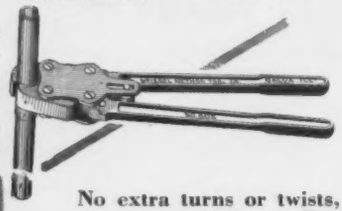

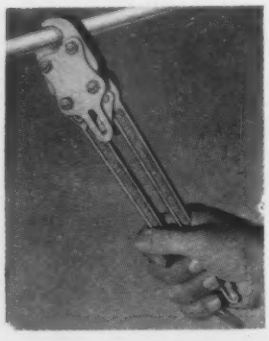

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National Enameling & Mfg. Co., Pittsburgh, Pa.
Triangle Conduit & Cable Co., Elmhurst, N. Y. C.

BRIEGEL METHOD TOOL CO., Galva, Ill.

PEOPLE
made this news

PSP&L Advances Williams To Assistant To The President

Advancement of L. A. Williams from the position of manager of the Everett, Wash., district to that of the executive assistant to the president, was announced recently by Frank McLaughlin, president of Puget Sound Power & Light Company.

Williams moves from Everett to Seattle after having started his tenure of service with PSP & L in Seattle in 1934. At that time he joined the company as advertising manager and later served as advertising sales promotion manager. In 1936 he was appointed to the position of manager of PSP & L's Everett district office. His appointment as executive assistant to the president comes as an outgrowth of increased duties assisting McLaughlin. The managership of the Everett office vacated by Williams is assumed by R. W. Joyce, formerly assistant to the manager of PSP & L's Central Division.

● COMMANDER FRANK M. HARRIS, chief of the bureau of specifications and estimates, Pacific Gas and Electric Co., has been ordered to active duty as Operations Officer under Rear Admiral Hugo Osterhaus, commander of the petrol force for the Twelfth Naval District. His headquarters will be on Treasure Island in San Francisco Bay.

● FRANK M. KOCH, formerly branch manager of General Electric Supply Co., Fresno, has been brought to headquarters to become lamp specialist, a position formerly held by Steve Perkins, now with the Naval Reserve. W. L. Duncan, formerly salesman in the Red Bluff area, has been made branch manager at Fresno.

Feature this fast selling, long profit line for Xmas—Attractive, Dependable, Modern, Economical—and needed in every home . . . Order from your jobber NOW!

Seven Leaguer, (L. P. 131) weighs 14½ lbs., long cord. Attractive finishes in morocco brown or ivory. 1320 watts, 120 volts, A.C. or D.C., Height 39½ in. Base Diameter 10 in.

Spred-Ray, (MP 121) radiates heat in large arc. 1250 watts, 120 volts, A.C. Chrome Top, duotone brown base and grille. 6 ft. cord, spring action plug. Height 17½ in., Width 10 in., Depth 10 in.

Heat Fan, (HF 161) Warms in winter, Cools in summer—White or morocco brown. 1650 watts 115 volts, Height 11⅞ in., Width 9¼ in., Depth 5⅝ in.

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Send for Catalogue
We have been making safety tools for 26 years

THE G. C. A. Manufacturing Co.
Pittsfield, Mass.

LEW FLOOR BOXES

Give You Greatest Flexibility in Floor Box Applications

A floor outlet for any type of floor construction.

LEW Floor Boxes and Fittings manufactured since 1930 are credited with being the finest made.

A TRIAL WILL CONVINCE YOU
Complete stock carried in Western Warehouse
CALL or WRITE

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1855 Industrial St., Los Angeles, Calif.

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630 W. Jackson Blvd., Chicago, Ill.

LIGHT MEASUREMENT IS *Simple* EVEN THOUGH LIGHT IS *Mixed!*

USING Fluorescent lighting? *You can measure it directly with a* WESTON *Illumination Meter.* Are there locations in your plant where fluorescent is combined with daylight, or with incandescent lighting? You measure the combined lighting in the same *simple* way! Just hold the WESTON at the working surface, and you get an instant, accurate measurement direct in foot-candles. No complicated corrections are ever necessary, regardless of the color composition of the light. And these WESTON Illumination Meters are available in types, sizes and ranges to suit the requirements of shops large and small . . . as well as for laboratory use. *All* supply the convenience of *direct* measurement . . . and all furnish the measurement *surety* which is typically WESTON. Full details can be secured from the WESTON representative near you, or, by writing . . . Weston Electrical Instrument Corporation, 577 Frelinghuysen Avenue, Newark, New Jersey.

WESTON

ILLUMINATION METERS

(VISCOR FILTER EQUIPPED)

measure the illumination from any single or any combination of light sources *direct* . . . without correction factors!

Model 703—Sightmeter—for maintaining lighting at efficient levels. A compact instrument for use in office, factory or home.

Model 603—Illumination Meter—a precision instrument for lighting surveys and measurements requiring a high degree of accuracy over a broad range of light values.

Model 614—Illumination Meter—offers compactness and wide range coverage. Hinged cell tilts at desired angle.

Laboratory Standards . . . Precision DC and AC Portables . . . Instrument Transformers . . . Sensitive Relays . . . DC, AC, and Thermo Switchboard and Panel Instruments. .

WESTON

Specialized Test Equipment . . . Light Measurement and Control Devices . . . Exposure Meters . . . Aircraft Instruments . . . Electric Tachometers . . . Dial Thermometers.

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San Francisco, Calif. Herman E. Held, 420 Market St.

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Phoenix, Ariz. J. E. Redmond Co., 448 W. Madison St.

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Stocked for the Coast Trade at

SAN FRANCISCO
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NOW—lower prices and higher capacities

There is a Tork Clock for every regular switching job: 60 minute, 4 hour or daily cycles.

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Felix Simon, P. O. Box 614 . . . . . Denver
H. Geo. Shefler, P. O. Box 1587 . . . Phoenix

● JOSEPH H. GUMZ has been appointed commercial and industrial sales manager for Pacific Gas and Electric Company, San Francisco, succeeding the late Harry Carroll. A member of Pacific Coast Electrical Assn. for 17 years, much of his activity with P.G. and E. has been in the gas sales department for commercial and industrial uses. Graduate of University of Illinois, he entered the utility business in 1913 with Western United Gas and Electric Co. in Illinois and later was with Public Service Co. of Northern Illinois. He joined P.G. and E. in 1922. In his new position he will be manager of both gas and electric sales.

● HERBERT H. BENFIELD, former sales manager of the Steel and Tubes Division of Republic Steel Co., and prior to that Pacific Coast district manager with headquarters in San Francisco, has been appointed New York district manager of Bulldog Electric Products Co.

● J. NORMAN ROBERTSON has joined the publicity department of the British Columbia Electric Railway Company, Vancouver, B. C. as editor of The Employee's Magazine, and editorial press representative for the company, according to announcement by James Lightbody, publicity director. Prior to joining the public utility Robertson was publicity and press representative for Odeon Theatres in British Columbia.

● HENRY KRUSE, former merchandise sales promotion director for Puget Sound Power & Light Co., has been promoted to sales promotion manager supervising all promotion and merchandise sales. C. W. Sherman, Olympia, Wash., southern division sales manager, takes over the position in Seattle as assistant personnel director. He is succeeded by W. B. Bonnett from the general sales office. C. E. Hess, also of the P S P & L organization, becomes sales promotion director.

● L. O. FRYER, former service manager and sales manager of the San Francisco Graybar office, has been made assistant manager of the Dallas office of the Graybar Electric Co. Operations of the five branches located in Houston, San Antonio, Fort Worth, Beaumont and New Orleans are directed from Dallas. Since leaving San Francisco in October, 1940, Fryer has been secretary of the company's general sales committee in New York

● HENRY HEDWALL, for twenty-fiive years connected with the accounting division of Seattle City Light, has resigned to become chief accountant for the Seattle transit system.

BALANCED DESIGN

- HIGH DIELECTRIC STRENGTH
- HIGH MECHANICAL STRENGTH
- EXACT DIMENSIONS AND UNIFORMITY

ILLINOIS

PORCELAIN LINE INSULATORS

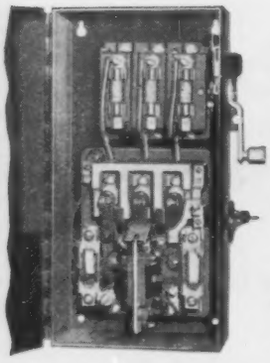
ILLINOIS ELECTRIC PORCELAIN CO. MACOMB. ILLINOIS

Joe...the employees in your new plant will be safer with G-E combination starters

"We've found that we can place these starters next to a machine without fear of operator's tampering with box while machine is in operation."*

*Statement by Raymond Dingler, chief electrician, Monolith Portland Midwest Co., Laramie, Wyoming

Safer than Separate Devices in 3 Ways—



SAFER because the fused manual circuit switch is *selected* for use with your motor—no danger from interrupting heavy overcurrents in an emergency.

SAFER because the cover *can't* be opened as long as the circuit switch is closed and power is applied to the starter and the machine.

SAFER because *as long as the cover remains open* the line switch cannot be accidentally closed, applying power to the parts being inspected.

GENERAL ELECTRIC

Seattle City Light Promotes Two Engineers

J. R. Peters, senior engineer of Seattle City Light, has been named supervising senior engineer, electrical, in charge of engineering construction, trouble-shooting, and maintenance of pole and line work and overhead street lighting divisions by E. R. Hoffman, superintendent. Peters entered the City Light in 1911, serving successively as inspector, locating engineer, assistant and senior engineer. Peters took time out to attend the U. S. Navy Reserve Officers Training school, where he holds commission as ensign.

E. L. Gibney has been named by Superintendent Hoffman as principal engineer, electrical, to have direct supervision and responsible charge of all engineering design on City Light, also "responsibility for engineering decisions on special technical problems arising on construction and operation of all units." Gibney came to City Light as junior draftsman in 1922, and has held positions as electrical draftsman, inside contractor, senior engineer and supervising senior engineer, in charge of the department's station design and construction.

● Eugene H. Merrill, chief engineer of the Utah Public Service Commission, has resigned to become senior industrial analyst in the power division of OPM in Washington, D.C. A University of Utah graduate, he has been with the commission for the past six years.

● V. A. Bloxham, sales supervisor, Southern California Edison Co. at Visalia, has been transferred to Santa Monica.

● Wilbur H. Mawhinney has been appointed chief clerk of the Southern division of the Utah Power & Light Company.

● J. F. Hines, former porcelain specialists at Chicago for Westinghouse Electric & Mfg. Co., has been transferred to Emeryville, Calif., to serve as Pacific Coast sales manager for the company's porcelain department. Hines joined Westinghouse in the test department at East Pittsburgh, Pa., in 1924, after completing his engineering work at the University of Kentucky. From 1927 to 1936 he served in various sales capacities for the company in the East and in 1940 was assigned to the Chicago office as porcelain specialist. Hines will make his headquarters at Emeryville, where the company manufactures a line of high- and low-voltage porcelain insulators.

John F. Farquhar, WWP Executive, Passes Away

John F. Farquhar, 58, general division manager, suburban divisions, of The Washington Water Power Co., died Nov. 16 at his home in Spokane. He entered the employ of the company in 1914 and had lived in Spokane for the past 27 years.

Farquhar was graduated from Lafayette college, Easton, Pa., with an electrical engineering degree in 1905 and entered the employ of the Westinghouse Electric & Manufacturing Co. He came to Moscow, Idaho, in 1908 and was secretary of the Idaho-Washington Light and Power Co. until 1914.

"The death of John Farquhar is a loss not only to The Washington Water Power Company, but also to the electric service industry in which he played a prominent part for so many years," said Kinsey M. Robinson, president of the company.

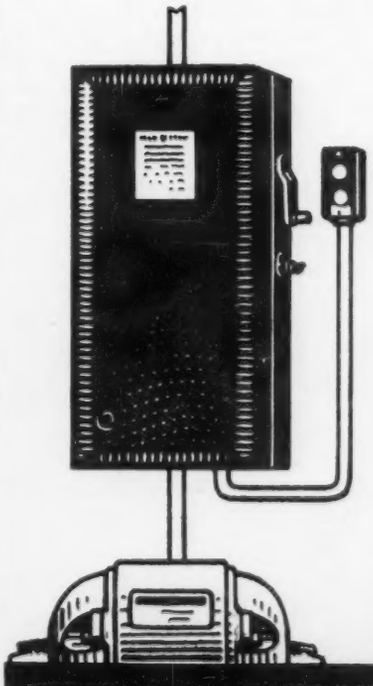
● W. L. "BILL" GOODWIN, remembered by many Westerners as a vice-president of the former Pacific States Electric Co., and as a pioneer in the electrical cooperative movement, died in Scarsdale, N. Y., Oct. 31. He had been engaged in electrical manufacturing activities in New York for the past several years.

● EDWIN W. KRAMER, regional director for the Federal Power Commission for the seven western states, San Francisco, died Nov. 1. Born in 1877, a graduate of Cornell University, 1905, he joined the U. S. Forest Service in 1907 for which he was a Park Director in Montana until 1936. He was then appointed regional director, Federal Power Commission, San Francisco. In the latter position, his engineering testimony for the U. S. Supreme Court was instrumental in giving the Federal government jurisdiction over all navigable streams in the New River case. He was a member of the California State Defense Council and also collaborated on the Central Valley project.

● J. H. CUNNINGHAM, manager of the central station department of the Los Angeles General Electric office, died October 29, at his home. He had ceased active work approximately 2½ months ago. As a member of the small motor department, Cunningham came to the Los Angeles office in 1913. Prior to this time he had been an instructor of electrical engineering at Union College. From 1917 until 1926 he was engaged in sales work in the Los Angeles district. On April 1, 1926, he was appointed manager of the Central Station department, a position he has since then held.

"Our experience shows that it takes less labor to install G-E combination starters than to put in separate devices. And they save on conduit."*

**Statement by Walter B. Atchinson, electrical engineer of a large valve plant*



Here's all an electrician needs to do to install a G-E combination starter

A. Mount one compact starter (not two devices).

B. Run conduit and pull wires to motor, push-button, and power supply.

C. Make 9 quick connections (not 15) in starter, insert fuses, and—motor is ready to run.

Send for "More for Your Control Dollar" (GES-2456). General Electric, Sec. 676-44, Schenectady, N. Y.

GENERAL ELECTRIC

676-44-8490

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PROFILES *of the month*

A combined experience of 150 years is gathered around one of the 108,000-kw. Grand Coulee generators (left to right: Sam P. Fisher, assembly foreman, Westinghouse; F. J. Malarkey, turbine erection engineer, Newport News Shipbuilding and Drydock Co.; H. Walter Berkley, erection supt. for Westinghouse; F. A. Smith erection engineer for Woodward Governor Co., and J. A. Kadletz, transformer erection engineer for G-E. Right: W. J. Heaslip, newly-appointed mgr. of manufacturing and repair dept., Westinghouse Electric & Mfg. Co., Seattle. Left below: W. J. Varey, business representative of S. F. Electrical Contractors Assn. confers with J. Walter Collins, mgr. Electrical Contractors Assn. in Chicago. Right below: George C. Thomas, Jr. (right) accepts the gavel as president of NEMA from retiring president Earl O. Shreve.

Preview of coming campaigns by P·G·and E·

ELECTRIC APPLIANCE SOCIETY OF NORTHERN CALIFORNIA

DECEMBER

Electrical Christmas Gift Campaign

Priority restrictions notwithstanding, there appear to be plenty of small electric appliances on dealers' shelves for another truly electrical Christmas, and we know from the way early shoppers are buying that these electrical appliance gifts are steadily increasing in popularity over the useless knick-knacks and doo-dads of other years.

Tying in with trend, the Electric Appliance Society is putting on another campaign in which P. G. and E. advertisements play up dealer gift merchandise, and, in addition, is supplying free poster advertising for windows and counters.

If YOU are a dealer and have not received word of this campaign, write the Society as indicated below, or telephone HEmlock 6030. Do it today!

E W 112-1241

DEALERS: By watching this page from month to month you can keep informed of sales promotional campaigns to be sponsored by the Pacific Gas and Electric Company and the Electric Appliance Society. Detailed information will be supplied, as usual, through the mail. If such information is not received, call our local office or write Electric Appliance Society, 1355 Market St., San Francisco, Calif.

YOU COAST DOWN-- NOT UP!

It took a lot of effort to get your business under way, just as it takes a lot of power to get a train of freight cars moving.

After the start, both business and train move along smoothly with less power.

And when a downhill grade is reached, train and business alike zoom along with little effort.

But the laws of gravity in physics and in business are inescapable.

If the power is off when the bottom of the hill is reached, making the next upgrade is problematical—many never make it.

Right now, we're covering a lot of ground—FAST, and it is thrilling—exhilarating. But don't forget that there is an upgrade ahead. Keep your power ready for a quick pick-up.

Keep your promotional work going, and start new promotional work now. Keep your name and your business before the eyes and in the minds of the forgetful public.

You of the electrical industry have spent time and money to make the public conscious of the advantages of adequate wiring, of Better Light for Better Sight, of innumerable convenient uses to which electricity can be put.

Keep the gains you have made. Don't slip back down the hill.

If you want to be among those present at the top of the next upgrade, include in your 1942 plans all the promotional work you can muster to keep your name and business before your public.

The basis of your future lies in well wired buildings throughout your territory, so include in all your promotional work, some message urging adequate wiring.

PACIFIC COAST ELECTRICAL BUREAU

601 WEST 5TH STREET LOS ANGELES • 447 SUTTER STREET, SAN FRANCISCO

CERTIFIED ADEQUATE RED SEAL STANDARD WIRING

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Imperfections such as missing issues, missing pages, errors in

pagination have been verified with the bound volume after filming.